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SITE-SPECIFIC SAMPLING AND ANALYSIS PLAN
PHASE II ENVIRONMENTAL SITE ASSESSMENT
AND
PRE-DEMOLITION LEAD-BASED PAINT, ASBESTOS CONTAINING MATERIALS, AND HAZARDOUS MATERIAL ASSESSMENT

2100 Northwestern Avenue
West Bend, Wisconsin

U.S. EPA Brownfield Cooperative Agreement No.: BF-00E01347-0

February1, 2016
Project Number 193703514

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February 1, 2016

Mr. Fred Bartman, Project Officer
U. S. Environmental Protection Agency
77 West Jackson Boulevard
Chicago, IL 60604-3507

Reference: U.S. EPA Brownfields Assessment Project – Washington County, Wisconsin
Cooperative Agreement No.: BF-00E01347-0
Submittal of Site-Specific Sampling and Analysis Plan
2100 Northwestern Avenue, West Bend, Wisconsin
Stantec Project No.: 193703514

Dear Mr. Bartman:

The Site-Specific Sampling and Analysis Plan (SSSAP) for the above referenced site is enclosed. Please contact us if you have any questions.

Sincerely,

STANTEC CONSULTING SERVICES INC.

David B. Holmes, PG
Senior Project Manager

C: Debora Sielski, Washington County

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1.0 INTRODUCTION

1.1 GENERAL

This Site-Specific Sampling and Analysis Plan (SSSAP) has been prepared on behalf of Washington County (hereinafter referred to as the "County") by Stantec Consulting Services Inc. (Stantec) for field sampling and associated laboratory analyses to be performed as part of a Phase II Environmental Site Assessment (ESA) of the property located at 2100 Northwestern Avenue in the City of West Bend, Wisconsin (the Property; the Site). The SSSAP also includes a lead-based paint (LBP), asbestos containing materials (ACM), and hazardous material survey of the Property buildings. The project is being performed using funds from an assessment grant for hazardous substance and petroleum brownfields awarded to the County by the United States Environmental Protection Agency (U.S. EPA) in 2014. The U.S. EPA approved the hazardous substance brownfield eligibility determination during September 2015. An eligibility determination for petroleum brownfields funding has been submitted to the Wisconsin Department of Natural Resources (WDNR). Approval is pending. The purpose for the assessment is to determine if the historic use of the Property has affected soil and/or groundwater quality at the Property.

1.2 SITE DESCRIPTION/BACKGROUND

The Property is located at 2100 Northwestern Avenue (Parcel ID#291-1119-024-0001) as illustrated on Figure 1. The Property consists of approximately 7.2 acres of land developed with a former manufacturing facility consisting of numerous interconnected one- and two-story buildings covering an approximate 68,000 square foot area near the center of the Property. The majority of the Property buildings were constructed prior to the 1960s. The remainder of the Property is covered by deteriorated pavement and areas covered by grass, brush, small trees, or forest. The Milwaukee River extends along the entire western Property boundary. Surrounding properties are a mix of residential and industrial properties, as well as a regional recreational trail that borders the eastern Property boundary.

The ground surface at the Property is divided into lower and upper terraces. The lower terrace extends adjacent to the Milwaukee River from the southwest corner of the Property building to the northern tip of the Property. The lower terrace widens significantly on the northern portion of the Property. The upper terrace extends across the remainder of the Property. The ground surface of lower terrace appears to have been elevated using fill during historic site development. Fill is also likely present in areas on the upper terrace.

The Property has a long history of industrial use. The primary item manufactured at the Property from at least 1929 to 1980 was a coal tar-impregnated cellulose-fiber pipe. Since 1980 various small businesses occupied portions of the facility buildings and the Property appears to have been used primarily for storage. Multiple plastic recycling businesses operated at the Property during the 1980s and 1990s and resulted in significant storage of plastic. Since the 1980s, the facility buildings were allowed to deteriorate with minimal repairs. Numerous permitted and unpermitted building modifications and demolitions have occurred at the Property. Remnants of supplies, equipment, and structures remain throughout the Property building.

In 2015, a judge approved a raze order for the building requested by the City of West Bend due to its deteriorated condition and the resulting hazards it presented to public safety. Therefore, it is anticipated that the building will be demolished during 2016.

1.3 ENVIRONMENTAL CONCERNS

Stantec completed a Phase I ESA at the Property on December 21, 2015 (Stantec, 2015a) that identified the following recognized environmental conditions (RECs).

- Industrial manufacturing activities including the historic transfer, storage, and use of coal tar at the Property.
- Historic outdoor storage of coal tar-impregnated cellulose-fiber pipe.
- The transfer and storage of petroleum products and documented diesel fuel release to soil on the Property.
- The historical presence on the Property of a railway spur, because transfer of hazardous materials and/or petroleum products may have resulted in spills and affected soil and/or groundwater quality at the Property, in particular, in the vicinity of the former railroad spur.
- The documented release of contaminants from the Property to the sanitary sewer system.
- Petroleum product and hazardous substances releases to soil at the Property documented in a Phase II ESA.
- Coal tar-impregnated cellulose-fiber pipe and pipe fragments comingled with other fill materials visible in areas on the north side of the Property.

To determine if legacy environmental impacts remain at the Site, Stantec is recommending that a Phase II ESA be completed. Common contaminants related with these RECs include volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), and Resource Conservation and Recovery Act (RCRA) metals. In addition, based on the Property building's construction time period, it is likely ACMs, LPB, and/or other hazardous substances were used in construction and/or maintenance of the buildings.

2.0 DATA QUALITY OBJECTIVES

2.1 PROBLEM STATEMENT

Based on the Property building's construction time period, it is likely ACM, LBP, and/or other hazardous substances were used in construction and/or maintenance of the buildings. Therefore, prior to proposed razing the Property buildings, a pre-demolition survey is needed to identify the type and quantity of potentially hazardous materials to evaluate and plan for abatement activities in conjunction with building demolition.

Various environmental concerns associated with the Property have been identified, but not yet fully investigated or assessed. The main objective for performing a Phase II ESA is to evaluate RECs identified in the Stantec Phase I ESA (Stantec, 2015a). Specifically, the purpose of the assessment is to confirm the presence of petroleum products and/or hazardous substances at the Property in conditions that constitute disposal or release, or provide sufficient information to render a professional opinion that there is no reasonable basis to suspect the presence of hazardous substances or petroleum products at the Property. If present and applicable, the extent and magnitude of release will be evaluated to assess appropriate remedial actions. Additional phases of investigation may be required based on the results of the initial Phase II ESA.

The Site is the initial priority brownfield site designated for assessment by the City of West Bend as a member of the Washington County USEPA Brownfields Assessment Grant Coalition. As a member of the Coalition, the City of West Bend was allocated $40,000 in initial grant funds to be used for assessment of the Site. Based on the initial budget allocated to the City, as well as the priority assigned to fulfilling the raze order, initial assessment activities are focused on hazardous building materials and soil. It is anticipated that an additional phase of sampling will be required at the Site to further delineate areas where soil impacts are documented during the initial assessment as well as to assess groundwater quality at strategic locations. Therefore, to avoid duplication of effort, the level of detail provided in the text of the initial report will be somewhat limited in anticipation that a comprehensive assessment of the nature and extent of impacts will be presented in a final report to be completed following the additional phase of sampling (subject to approval of allocation of additional grant funds to the Site by the County's Site Redevelopment Committee).

2.2 ASSESSMENT REQUIREMENTS

Following are key observations by Stantec relevant to developing a scope for assessment activities:

- **Need for further assessment of hazardous building materials** – The previous assessment during 2012 and/or 2013 of building materials at the Property included only ACMs analysis. The previous ACM assessment was somewhat limited in scope, did not assess all portions of the Property building, and provided little documentation of sample locations and actual abatement efforts. No testing of building materials for the presence of LBP or other hazardous building materials is known to have been conducted at the Property. Therefore, a full survey of the entire Property building for ACMs and LBPs is required and proposed as part of the Phase II ESA.
- **Evaluation of remnant coal tar-impregnated cellulose-fiber pipe and pipe fragments** - pipe and pipe fragments comingled with other fill materials present in areas on the north side of the Property require characterization to determine appropriate disposal options. Characterization would include laboratory analysis for asbestos and PAHs.
- **General constituents of concern** – The primary constituents of concern are PCBs, PAHs, RCRA metals, and VOCs. The historic soil sampling activities identified petroleum

compounds associated with a former diesel fuel AST and PCBs associated with electrical transformers and a pulp vat (Fox Environmental, 1990). The Phase I ESA identified additional possible sources of petroleum compounds (former petroleum ASTs), PAHs (coal tar), RCRA metals (railroad spur, historic fill). These constituents of concern will therefore be the focus for assessment activities.

- **Further assessment of documented and potential release areas** – Previous soil sampling completed at the Property identified petroleum and PCB contamination in soil. Several additional potential areas of environmental concern were identified in Stantec's 2015 Phase I ESA (Stantec, 2015a). Based on historic use and identified potential environmental concerns, Stantec divided the Property into the following six areas listed below and highlighted on Figure 3.

  Area A – Northern former coal tar-impregnated pipe outdoor storage area
  Area B – Former coal tar and petroleum product AST area
  Area C – Building interior
  Area D – Southern former coal tar-impregnated pipe outdoor storage area
  Area E – Former railroad spur
  Area F – Former electrical transformer and diesel fuel contamination area

Additional discussion of soil sample locations and analysis is provided in Section 4.0.

3.0 HAZARDOUS MATERIALS ASSESSMENT

3.1 GENERAL

Since near-term plans for the Property include demolition of the building, an assessment of hazardous building materials, including ACMs and LBP will be performed as completed at the Site. ACM and LBP sampling will be completed by NorthStar Environmental Testing, LLC (NorthStar) under subcontract to Stantec. An inventory of petroleum products or hazardous materials stored on the Property in drums or other containers will be completed by Enviro-Safe Resource Recovery under subcontract to Stantec.

3.2 OBJECTIVES

The Hazardous Materials Assessment described in this sampling and analysis plan is designed to characterize the types, quantities, and location of ACMs, LBP, and other hazardous materials present in the building. The entire building will be surveyed for the purpose of identifying abatement and mitigation requirements for demolition. The proposed survey will also assist in developing a plan to abate and/or properly dispose of these materials prior to demolition activities.

Numerous 1-quart to 5-gallon containers of paint, gasoline, motor oil, cleaning supplies, etc. and approximately ten 55-gallon barrels containing various amounts of unknown liquid were observed inside the building during the Phase I ESA site reconnaissance. This containerized material will be assessed and inventoried to determine appropriate disposal options.

3.3 CONTAINERIZED MATERIAL ASSESSMENT

Numerous 1-quart to 5-gallon containers of paint, gasoline, motor oil, cleaning supplies, etc. and approximately ten 55-gallon barrels containing various amounts of unknown liquid were observed inside the building during the Phase I ESA site reconnaissance. This containerized material will be assessed and inventoried by Enviro-Safe Resource Recovery (under subcontract to Stantec) to determine appropriate disposal options. Enviro-Safe Resource Recovery is a firm based in Washington County that specializes in disposal, recycling, and beneficial reuse of hazardous materials and petroleum products, in particular, those associated with industrial facilities.

3.4 ACM SAMPLING SCOPE AND METHODOLOGY

The ACM assessment will include the following activities:

- Completion of a site visit for a building survey to detect the presence of ACMs throughout the Property building.
- Bulk sampling of representative suspect interior and exterior building materials. Samples of roofing materials will also be collected. All sampling will be performed by a licensed asbestos inspector accredited by the State of Wisconsin.
- Sample analysis by a laboratory accredited under the National Voluntary Laboratory Accreditation Program (NVLAP).
- Preparation of a final report approximately 10 days following the completion of the site visit that will include an inventory of ACM types and estimated quantities.
- Inclusion of a building diagram that will be used to associate sampling locations with individual rooms.

Bulk samples of suspect ACMs will be collected following Stantec SOP-06 submitted under chain-of-custody to a NVLAP accredited laboratory for analysis by polarized light microscopy (PLM) to evaluate whether asbestos fibers are present. The bulk samples will be analyzed using the U.S. EPA *Method for the Determination of Asbestos in Bulk Building Materials*, Method 600/R-93/116. This method states that all multiple, distinct layers identified by the laboratory must be analyzed individually. Therefore, sample analytical results will be provided for each distinct layer of each sample submitted.

In addition to evaluating a bulk sample for layers, regulatory procedures require that a confirmatory "Point Counting" test be performed on all samples resulting in an initial positive PLM result of <1% asbestos content. This more precise (and expensive) test is required to prove that a low subjective percentage reading is actually quantified as being correct.

3.5 ASBESTOS ANALYSIS LABORATORY DOCUMENTATION

Analysis of samples for asbestos will be performed by CEI Labs, Inc. of Cary, North Carolina (NVLAP Lab Code: 101768-0). Documentation related to CEI Labs, Inc. is being incorporated into Revision 1 of the Quality Assurance Project Plan (QAPP), for which revisions are in progress. Revision 0 of the QAPP was conditionally approved by U.S. EPA on November 20, 2015. Copies of the Quality Assurance Manual for CEI Labs, Inc., their SOPs for asbestos analyses, and the current laboratory certification are presented in Appendix B.

3.6 LBP SAMPLING SCOPE AND METHODOLOGY

The scope of work for testing of LBP surfaces will include the following:

- Testing for the presence of LBP for demolition disposal/recycling issues using X-ray fluorescence (XRF) technology.
- Representative testing locations will be chosen for each type of painted substrate throughout the structures. Testing will be limited to cementitious materials (concrete, concrete block, brick, etc.).
- A final report will be prepared that includes testing data listed in a room by room format.
- Testing will be performed by a State of Wisconsin accredited lead risk assessor.
- Lead paint testing will be completed concurrent with asbestos testing (same site visit).

Suspect LBP chips will be collected following Stantec SOP-12. Representative testing locations will be chosen for each type of painted substrate within each area of the buildings.

3.7 ASSESSMENT LIMITATIONS

Limitations to performing the survey may include: confined spaces or areas possessing high voltage equipment not able to be properly de-energized with effective lock-out/tag-out procedures; structurally unsafe areas; isolated or inaccessible building areas; mechanical spaces or equipment that would require extensive demolition or dismantling to provide adequate access for material identification or sampling.

Additional presumed-ACM that may be located in spaces not accessible during the survey, hidden from view, or not sampled at the client's request, may require additional sampling prior to disturbance by future renovation or demolition activity. Materials or areas with limited accessibility such as underground piping, boiler interiors, vessel and tank lining, chimney/flue/stack interiors, false ceiling/wall cavities, gasket material, subsurface building

adhesives and caulk, fire door interiors, electrical components/wiring/equipment and similarly inaccessible items may require assumption of asbestos content for inclusion in the survey.

Quantification of asbestos materials will be estimated and inventoried with a room-by-room format. The estimates will be based on visible conditions and may require verification by building owner or abatement/renovation contractor prior to use for renovation design, bidding and/or regulatory compliance notification purposes.

4.0 SOIL ASSESSMENT

4.1 GENERAL

Proposed soil sampling locations and analyses are based on the environmental concerns and assessment requirements detailed in Sections 1.3 and 2.2, respectively. Diggers Hotline will be contacted to locate and mark the locations of registered utilities in the project area. A private locating contractor may be retained to locate on-site and/or private underground utilities. Any investigative waste (i.e. soil cuttings and fluids) will be placed into labeled containers. Appropriate disposal of the waste will be determined based on the results of laboratory analyses.

The locations for each soil boring will be documented using global positioning satellite (GPS) survey equipment. A site-specific Health and Safety Plan (HASP), to be utilized by Stantec personnel during the assessment activities, is presented in Appendix A.

4.2 OBJECTIVES

The goal of the soil assessment is to evaluate soil quality at the Property. Soil boreholes will be advanced across the Site in a grid pattern to evaluate the extent and concentration of potential contamination. The Property will be divided into the following six areas of concern as shown on Figure 2.

Area A – Northern former coal tar-impregnated pipe outdoor storage area
Area B – Former coal tar and petroleum product AST area
Area C – Building interior
Area D – Southern former coal tar-impregnated pipe outdoor storage area
Area E – Former railroad spur
Area F – Former electrical transformer and diesel fuel contamination area

Standard operating procedures (SOPs) for tasks associated with this work plan are presented in the Quality Assurance Project Plan (QAPP) prepared by Stantec on July 10, 2015 (Stantec, 2015b).

4.3 SOIL BORING AND SUBSURFACE ASSESSMENT

The soil assessment will include 30 soil boreholes advanced using direct-push soil sampling equipment. Proposed borehole locations and depths were chosen after considering specific environmental concerns within each area. Soil samples will be collected continuously in each borehole extending to a maximum depth of 16 feet below ground surface (fbgs). The actual number and locations of borings may be adjusted based on accessibility, the locations of underground utilities, and on-site field screening data. The proposed borehole locations are illustrated on Figure 3. The sampling rational for Areas A through F is provided below and in Table 1. The proposed laboratory analysis types and quantities are also included in Table 1.

<u>Area A</u>

This area primarily was the former coal tar-impregnated pipe storage area. Remnants of pipe remain on the ground-surface in this area. Since coal tar contains high concentrations of PAHs, it is likely that at least near surface soil in this area contains elevated PAH concentrations associated with exposure of exposed pipe to precipitation and cumulative long-term leaching of PAHs from pipe (or washing off of particulate matter containing coal tar) and accumulation in surface soil subject to PAH-contaminated runoff . Therefore, the primary goal in this area is to determine if near-surface soil has been affected by the long term storage of coal tar-

impregnated pipe. A secondary goal will be to determine the type(s), depth, and extent of fill in this area. Four boreholes will extend only to 4 fbgs. Seven boreholes will extend to the apparent water table.

As a first to step in the characterization of remnant coal tar-impregnated pipe for possible future off-site disposal, two samples of the pipe will be submitted for laboratory analysis to determine if contaminants associated with coal tar (PAHs) remain and if pulp used in the pipes was mixed with asbestos (as was reportedly the practice for some manufacturers of this type of pipe).

Area B

This area was the former location of four 25,000-gallon coal tar ASTs and at least two ASTs that likely stored petroleum products (i.e. diesel fuel, gasoline, and/or fuel oil). The primary goal in this area is to determine if the transfer and storage of petroleum products in this area caused a release to soil. Secondary goals will be to determine the type(s), depth, and extent of fill and whether contamination associated with coal tar is present in this area. Two boreholes will extend only to 4 fbgs. Two boreholes will extend to the apparent water table.

Area C

The interior of the Property building will be identified as Area C. The primary goal in this area is to determine if historic industrial building uses caused a contaminant release to soil. Soil samples will be collected from seven boreholes inside the building. Boreholes will be placed adjacent to two former elevator pits, a former pulp vat, and former coal tar-impregnated pipe manufacturing area and the remainder will be spaced throughout accessible areas of the building interior.

Area D

Before the 1950s this area was used to store coal tar-impregnated pipe storage. Similar to Area A, near surface soil in this area may contain elevated PAH concentrations. Therefore, the primary goal in this area is to determine if near-surface soil has been affected by the historic storage of coal tar-impregnated pipe. A secondary goal will be to determine the type(s), depth, and extent of fill in this area. Soil samples will be collected from three boreholes in this area. Two boreholes will extend only to 4 fbgs and one borehole will extend to the apparent water table.

Area E

A railway spur formerly extended through this area. Because transfer of hazardous materials and/or petroleum products along the railroad spur may have resulted in spills and affected soil and/or groundwater quality at the Property, near-surface soil samples will be collected from two boreholes in this area. The boreholes will extend to 4 fbgs.

Area F

A diesel fuel release to soil was identified in this area. In addition, six electrical transformers were formerly located in this area. Soil samples will be collected from three boreholes completed in this area to determine if oil was released to soil from the transformers and provide additional information regarding the magnitude and extent of the diesel fuel-contaminated soil. All boreholes will extend to the apparent water table.

4.3.1 Soil Sampling Methods

Soil sampling and field classification will be conducted according to SOP No. 02 (Stantec, 2015b). Sample collection and laboratory analytical methods for soil samples, as well as the rationale for selecting sample locations and criteria to be used for selection of specific depth intervals for analysis, are presented in Table 1. In addition, pertinent observations noted during installation of the soil borings will be documented on the soil boring logs.

Each soil sample will be assigned a SIN based on the following format:

Sample Type	Label for Type of Sample	Location Number	Sample Interval (feet bgs)	Sample Round	Sample Identification No. (SIN)	Location ID
Soil boring	SB	1	(0-2)	---	SB1(0-2)	SB1
Trip blank	TB	---		Number	TB1	---

bgs = below ground surface

Soil samples will be field screened for the presence of VOCs using a photoionization detector (PID) as described in SOP No. 01 (Stantec, 2015b). The PID will be calibrated daily in the field in accordance with the manufacturer's specifications. Immediately following collection, soil samples will be placed in pre-preserved laboratory supplied containers and stored on ice in a cooler as detailed in the QAPP (Stantec, 2015b). Any visual evidence of contamination will be noted on the field log. Soil samples will be submitted in accordance with SOP No. 02 (Stantec, 2015b).

Soil sampling equipment such as drilling tools will be decontaminated prior to arrival on-site and between each sampling location (SOP No. 08, Stantec, 2015b). Soil borings not completed as temporary ground-water monitoring wells will be sealed in accordance with Chapter NR 141.25 Wisconsin Administrative Code by backfilling with bentonite after completion of drilling and soil sampling.

Investigative wastes generated will be managed per SOP No. 10 (Stantec, 2015b). In general, waste soil cuttings or core samples will be collected in Department of Transportation (DOT)-approved 55 gallon drums or other appropriate containers, sealed, labeled and stored on site pending the completion of laboratory analysis and determination of disposal restrictions, if any. As appropriate, waste soil will be handled, transported and disposed of by a licensed waste hauler per federal and state requirements. The generator of the waste will be the property owner at the time of the investigation.

4.3.2 Special Handling Considerations and QA/QC Samples

Soil samples collected from the unsaturated zone from each boring will be submitted for laboratory analyses as summarized on Table 1. All soil samples will be collected and preserved in accordance with SOP No. 02 and Table 4 of the QAPP (Stantec, 2015b). The laboratory will supply the appropriate containers. Samples will be submitted to the laboratory as soon as possible after collection (i.e. on a daily basis).

Quality assurance/quality control (QA/QC) samples to be collected and analyzed will include trip blanks, equipment blanks (for any non-disposable equipment used) and field replicate/duplicate samples. Trip blanks prepared by the analytical laboratory will accompany the sample bottles from the time of shipment from the laboratory through the time the samples are returned for analysis. Trip blanks will be used to document any contamination detected in samples that may be attributable to shipping and field handling procedures, or contaminated sample containers. Trip blanks will be provided by the laboratory and will be subject to the same handling and transportation procedures as the investigative samples. At least one trip blank sample will accompany each shipping container that contains samples for VOC analysis.

If non-disposable sampling equipment is used, equipment blanks will be prepared by: (a) filling the decontaminated sampling device with laboratory-supplied reagent-grade water, (b) transferring the water to appropriate sample containers, and (c) submitting the sample for analysis. If contaminants are found in the equipment or trip blanks, the source for the contamination will be assessed and corrective action measures taken (such as modifying the sampling procedures and/or resampling as appropriate). The estimated number of equipment

blank samples to be analyzed for each constituent is shown in Table 1. Please note that it is anticipated that only disposable sampling equipment will be used and that equipment blanks will therefore not be required.

4.3.3 Chain-Of-Custody

Chain-of-custody procedures will be utilized to track possession and handling of individual samples from the time of collection in the field through the time of delivery to the analytical laboratory. The chain-of-custody program will include use of sample labels, custody seals, field logbooks, chain-of-custody forms, and laboratory logbooks. All chain-of-custody procedures will be performed in accordance with SOP No. 07 (Stantec, 2015b).

4.3.4 Field Log Book

An up-to-date field log book will be maintained by each sampling team to document daily activities (if more than one group of individuals is sampling). The log book will include a general list of tasks performed, additional data, or observations not listed on field data sheets, and document communications with on-site personnel or visitors as these apply to the project.

5.0 REPORTING

A report summarizing the results of the Phase II ESA will be completed. The Phase II ESA will identify the physical subsurface conditions and determine if RECs identified in the Phase I ESA for the Property resulted in contaminant releases to soil. The Phase II ESA report will include:

- Laboratory Analytical Reports
- Soil boring logs
- Monitoring Well Construction Forms
- Field PID data
- Groundwater Elevation Data
- Tables Summarizing Analytical Results for Soil Samples
- Maps of Boring Locations and Utilities
- Potentiometric Surface Map of Shallow Groundwater

Recommendations for future actions, if any, to facilitate redevelopment of the Property will be provided in the Phase II ESA Report.

It is anticipated that an additional phase of sampling will be required at the Site to further delineate areas where soil impacts are documented and to assess groundwater quality at strategic locations. Therefore, to avoid duplication of effort, the level of detail provided in the text of the initial report will be somewhat limited in anticipation that a more complete assessment of the nature and extent of impacts will be presented in a final report to be completed following the additional phase of sampling.

6.0 REFERENCES

Fox Environmental Services, Inc., "Phase II Assessment Report, 2100 Northwestern Avenue, West Bend, Wisconsin, May 1990.

Stantec Consulting Services Inc. "Phase I Environmental Site Assessment, Former Bermico/Line Material Co. Property, West Bend, Wisconsin." December 21, 2015(a).

Stantec Consulting Services Inc. "Quality Assurance Project Plan (Revision 0), Implementation of U.S. EPA Assessment Grants for Petroleum and Hazardous Substance Brownfields, Washington County, Wisconsin, U.S. EPA Cooperative Agreement No. BF-00E01347-0" July 10, 2015(b).

TABLE

TABLE 1
PROPOSED LABORATORY ANALYSES FOR SOIL
2100 Northwestern Avenue
West Bend, Wisconsin

Area of Concern	Number of Bore-holes	Estimated Soil Boring Depth	Rationale	Laboratory Analysis					
				Laboratory Analysis Criteria	Estimated # of Samples Submitted for Laboratory Analysis				
					VOCs (8260)	PAHs (8270)	PCBs (8082)	Asbestos	RCRA Metals (6010)
A	-	-	Samples of remnant coal-tar impregnated pipe will be collected and laboratory analyzed as the initial step in characterizing the debris.	Collect sample of pipe and/or pipe fragments present on ground-surface from the northern and southern portions of Area A		2		2	
A	7	to observed water table (up to 16 fbgs)	Soil samples will evaluate potential contamination associated coal tar-impregnated pipe storage and the type(s), depth, and lateral extent of fill.	Highest PID from each borehole (or just above water table if no PID response).	7	-	-	-	-
				Near-surface and 4 fbgs from each borehole.	-	14	-	-	-
				Apparent anthropogenic waste/fill materials and near-surface adjacent to former railroad ROW.	-	-	-	-	3
A	4	4 fbgs	Soil samples will evaluate near-surface potential contamination associated coal tar-impregnated pipe storage.	Near-surface from each borehole.	-	4	-	-	-
				Near-surface from 2 boreholes closest to former ASTs.	-	-	-	2	-
B	2	to observed water table (up to 12 fbgs)	Soil samples collected in this area will evaluate potential contamination associated coal tar and petroleum ASTs and the type(s), depth, and lateral extent of fill.	Highest PID from each borehole (or just above water table if no PID response).	2	-	-	-	-
				Near-surface and 4 fbgs from each borehole.	-	4	-	-	-
				Near-surface from the borehole in coal tar AST area.	-	-	-	1	-
	2	4	Soil samples will evaluate near-surface contamination associated with coal and petroleum ASTs.	Near-surface from each borehole.	-	4	-	1	-
C	6	to observed water table (up to 16 fbgs)	Evaluate potential contaminant releases beneath the building associated with historic industrial uses.	Highest PID from each borehole or just above water table if no PID response.	6	6	-	-	-
				Apparent anthropogenic waste/fill materials.	-	2	-	-	2
C	1	to observed water table (up to 12 fbgs)	Evaluate potential PCB and/or RCRA metals release to underlying from pulp historically stored in vault.	Soil immediately beneath vault.	-	1	1	-	1
D	1	to observed water table (up to 12 fbgs)	Soil samples will evaluate potential contamination associated coal tar-impregnated pipe storage and the type(s), depth, and lateral extent of fill.	Highest PID from each borehole.	1	-	-	-	-
				Near-surface and 4 fbgs from each borehole.	-	2	-	-	-
				Apparent anthropogenic waste/fill materials and near-surface adjacent to former railroad ROW.	-	-	-	-	1
				Unsaturated soil just above water table.	1	-	-	-	-
D	2	4 fbgs	Soil samples will evaluate near-surface potential contamination associated coal tar-impregnated pipe storage.	Near-surface from each borehole.	-	2	-	-	-
E	2	4 fbgs	Soil samples will evaluate near-surface potential contamination associated historic railroad spur and coal tar unloading.	Near-surface from each borehole.	-	2	-	-	2
F	3	to observed water table (up to 12 fbgs)	Soil samples collected in this area will evaluate potential contamination associated coal tar and petroleum ASTs and the type(s), depth, and lateral extent of fill.	Highest PID from each borehole	3	3	-	-	-
				Near-surface and 4 fbgs from each borehole.	-		6	-	-
				Unsaturated soil just above water table.	3	-	-	-	-
Estimated number of investigative samples to be analyzed					**23**	**44**	**7**	**4**	**9**
Trip Blank		Field and laboratory QA/QC sample.	1 per cooler		2	-	-	-	-
Field Blank		Assess the quality of the data and collection techniques.	Not required - sampling equipment all disposable		-	-	-	-	-
MS/MSD		Evaluate laboratory matrix and measurement methodology.	At least 1 per 20 samples		1	2	-	-	1
Field Duplicates			At least 1 per 20 samples		1	2	-	-	1
Estimated number of QA/QC samples to be analyzed					**4**	**4**	**0**	**0**	**2**
Estimated total number of samples to be analyzed					**27**	**48**	**7**	**4**	**11**

Notes:
actual depths for various laboratory analysis may change based on field observations
fbgs = feet below ground surface
AST = aboveground storage tank
FD = Field Duplicate
MS/MSD = matrix spike/matrix spike duplicate
PAH = Polycyclic Aromatic Hydrocarbons
PCB = polychlorinated biphenols
PID = photoionization detector
QA/QC = Quality Assurance Quality Control
RCRA = Resource Conservation and Recovery Act
ROW = right of way
VOC = Volatile Organic Compounds
(6010) = Laboratory analytical method (SW-846)

FIGURES

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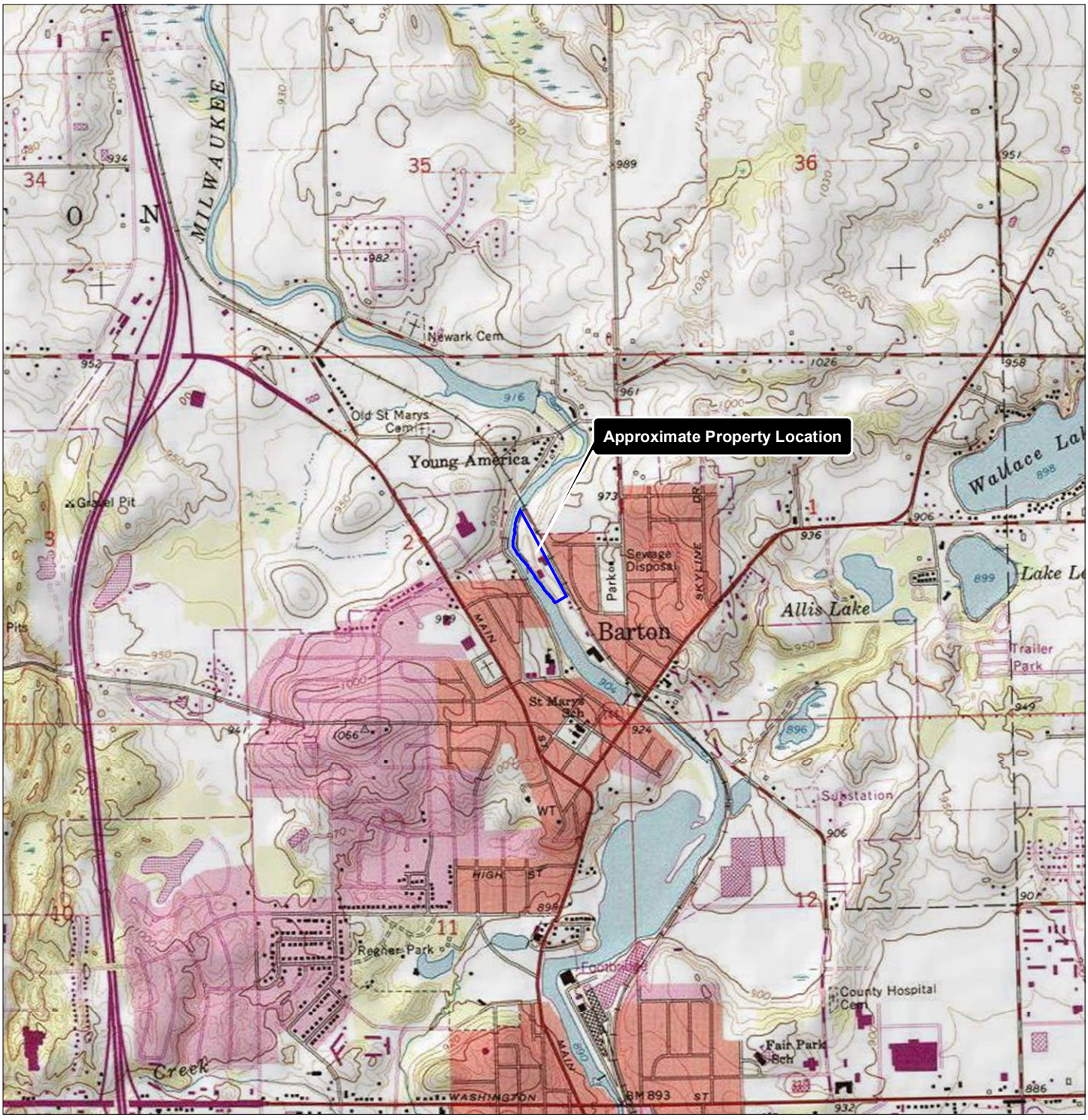

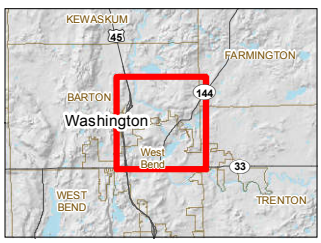

Legend

Approximate Property Location

Notes

1. Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet
2. Data Sources Include: Stantec
3. Background: USGS 7.5' Topographic Quadrangles

Figure No.

1

Title

Property Location Map

Client/Project

Washington County
Former Bermico/Line Material Co. Property
2100 Northwestern Avenue, West Bend, Wi

Project Location

T11N, R19E, S02
C. of West Bend,
Washington Co., WI

193703514

Prepared by BWT on 2015-10-30
Technical Review by MP on 2015-11-03
Independent Review by XX on 2015-XX-XX

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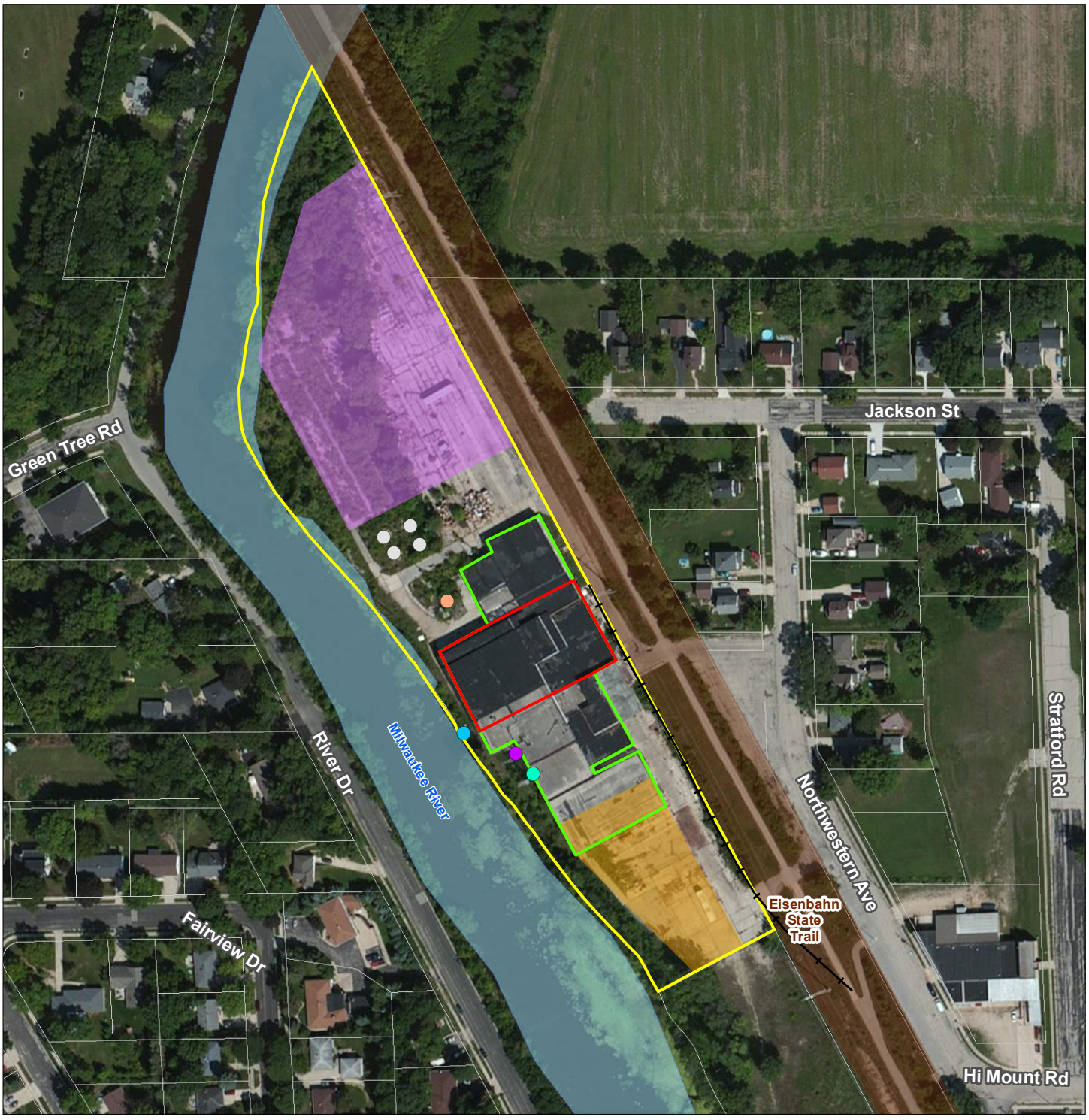

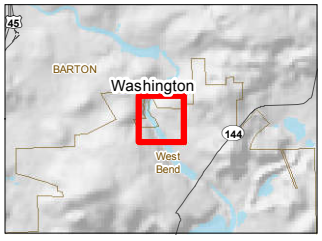

Notes

1. Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet
2. Data Sources Include: Stantec, WDNR, PADUS
3. Orthophotography: 2013 ESRI

Legend

- Approximate Property Location
- Former Railroad Spur
- Former 25,000 Gallon Tar AST's
- Former Diesel Fill Pipe
- Former Pump House
- Former Transformers
- Pre-1990s AST's
- Original Manufacturing Building
- Building Footprint
- Former Pipe Storage Yard (pre-1960s)
- Finish Product Storage Area (1950s to 1980s)
- State Trail
- Parcel Boundaries
- Waterbody

Figure No.
2

Title
Property Vicinity Map

Client/Project
Washington County
Former Bermico/Line Material Co. Property
2100 Northwestern Avenue, West Bend, Wi

Project Location
T11N, R19E, S02
C. of West Bend,
Washington Co., WI

193703514
Prepared by BWT on 2015-10-30
Technical Review by MP on 2015-11-03
Independent Review by XX on 2015-XX-XX

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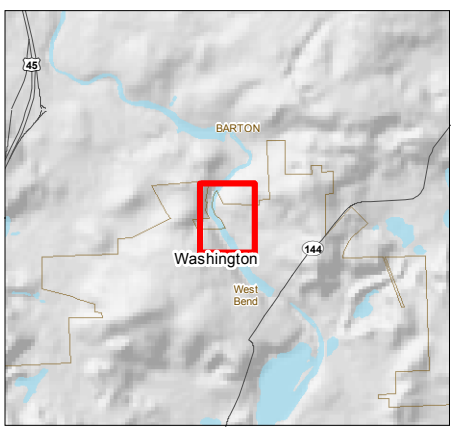

Notes

1. Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet
2. Data Sources Include: Stantec
3. Orthophotography: ESRI

Legend

- Soil Borehole Location
- Near Surface Soil Sample Location
- Building Interior Borehole Location

Boring Areas

- Area A
- Area B
- Area C
- Area D
- Area E
- Area F

Figure No.

3

Title

Proposed Boring Locations

Client/Project

Washington County
Former Bermico/Line Material Co. Property
2100 Northwestern Avenue, West Bend, WI

Project Location

T11N, R19E, S02
C. of West Bend,
Washington Co., WI

193703514
Prepared by BWT on 2016-01-12
Technical Review by CP on 2016-01-12
Independent Review by XXX on 2014-XX-XX

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Stantec

APPENDIX A – SITE-SPECIFIC HEALTH AND SAFETY PLAN

Site-Specific Health and Safety Plan

2100 Northwestern Avenue
West Bend, Wisconsin

U.S. EPA Brownfield Cooperative Agreement No.: BF-00E01347-0

January 22, 2016

Project Number 193703514

Stantec

Stantec

SITE- SPECIFIC HEALTH AND SAFETY PLAN
2100 Northwestern Avenue
West Bend, Wisconsin

January 22, 2016

Prepared For:
Mr. Fred Bartman, Project Officer
U. S. Environmental Protection Agency
77 West Jackson Boulevard
Chicago, IL 60604-3507

Prepared By:
Stantec Consulting Services Inc.
12075 Corporate Parkway Suite 200
Mequon WI 53092-2649

The information presented in this Site-Specific Health and Safety Plan is intended solely to denote the health and safety measures/guidelines applicable to Stantec personnel engaged in field activities at the above-referenced site. Stantec makes no warranties regarding the accuracy of the Site-Specific Health and Safety Plan, and nothing contained herein shall be construed as providing recommendations or direction, either expressed or implied, regarding health and safety measures to be taken by anyone other than Stantec personnel. Non-Stantec personnel shall be responsible for complying with site safety plans and local, state, and/or federal regulations applicable to non-Stantec personnel.

Stantec Project Number: 193703514

David Holmes, PG
Senior Project Manager

c: Debora Sielski, Washington County

Table of Contents

1.0 Introduction

The purpose of this Site-Specific Health and Safety Plan (SHSP) is to identify, evaluate and control the safety and health hazards associated with the planned tasks to complete a Phase II ESA at 2100 Northwestern Avenue in West Bend, Wisconsin and ensure the health and safety of all Stantec employees involved. The planned tasks are outlined in the Site-Specific Sampling and Analysis Plan (SSSAP).

All field activities must be conducted in compliance with this SHSP. Personnel covered by this SHSP who cannot or will not comply with the SHSP will be excluded from on-site activities. Anyone who will be on site will be required to sign the SHSP review found in this SHSP.

Contractors and sub-contractors will be given a copy of this SHSP and will sign the review acknowledging that they have read and understood this SHSP. Their signature indicates that Stantec has informed them of the site emergency response procedures and any potential fire, explosion, health, safety or other hazards of the hazardous waste operation that have been identified. However, Stantec does not assume responsibility for the actions of the contractors or sub-contractor. Contractors will be required to develop and follow their own SHSP related to specific on-site activities.

This SHSP was prepared from the best available information concerning site conditions at the time of development. The health and safety specifications in this SHSP are based on reasonably available sampling information and reports. The project manager or site safety officer have the authority to amend any part of this program at any time due to changes to site conditions that may affect the health and safety of on-site personnel.

2.0 Background Information

1. Site Name: 2100 Northwestern Avenue, West Bend, Wisconsin
2. Site Location: 2100 Northwestern Avenue, West Bend, Wisconsin
3. Client Name: Washington County
4. Client Contact: Debora Sielski Phone: (262) 335-4445
5. Stantec Project Manager: David Holmes Phone: (262) 643-9177
6. Anticipated On-Site Personnel:

NAME	AFFILIATION	FUNCTION
David Holmes	Project Manager	Supervisor
Chris Hatfield	Senior Geologist	Site-Safety Officer
Andy Swaim	Geologist	Site-Safety Officer
Nick Heim	Geologist	Site-Safety Officer

7. Plan Prepared by: Chris Hatfield, P.G. Date: 1/22/2016
8. Plan Reviewed by: David Holmes, P.G. Date: 1/22/2016

The Project Manager and Site-Safety Officer (SSO) or an alternate designee will be responsible for the implementation of this SHSP. Provided below are the key titles and associated responsibilities for personnel that are involved in the site activities.

PROJECT MANAGER

The Stantec Project Manager provides overall direction for the implementation of field activities in accordance with this SHSP. The Project Manager will also serve as the program liaison to federal, state, and local authorities. Specific program questions will be directed to this individual.

SITE-SAFETY OFFICER

The SSO will be the Stantec field supervisor. She/he will direct the implementation and field evaluation of the SHSP. The SSO will be in charge during any emergency until she/he is relieved by Fire or other senior Emergency Responders. The SSO will be responsible for:

- Conduct health and safety briefings for Stantec employees based upon potential hazards specific to the designated work tasks scheduled
- Modify SHSP as required to address specific situations
- Investigate and report on-site accidents/incidents

3.0 Site Information

1. Purpose of Investigation/Field Work: This work is being performed as part of a Phase II Environmental Site Assessment (ESA) of the property located at 2100 Northwestern Avenue in the City of West Bend, Wisconsin (herein referred to as the Site or Property). The location of the Site is illustrated on Figure 1.

2a.	Potential Hazard to Personnel	2b.	Protective Equipment Required
	Fire/explosive condition	X	First aid kit
X	Worker exposure/injury	X	Eye wash
	Confined spaces	X	Ladder
X	Steep/uneven terrain	X	Fire Extinguisher
X	Chemical/contaminant exposure	X	Safety Glasses
X	Traffic/heavy machinery	X	Communication
X	Noise exposure	X	Hard Hat
X	Thermal/cold exposure	X	Hearing Protection
	Respirator/SCBA		Tyvex™ Suit
		X	Latex Gloves

_____ Other (describe) _____

Estimated days on site: four days

4.0 Contaminant/Chemical Hazard Assessment

1. The purpose of this work is to determine if historic use of the Site resulted in a hazardous substance and/or petroleum product release occurred. The following assessment is related to on-site substances which may potentially be encountered.

SUBSTANCE	MAXIMUM CONCENTRATION (UNITS)	MEDIUM[1,2]	PEL/TLV (PPM)[3]	CANCERSTATUS[4]	ROUTE[5]
VOCs/PAHs		S, GW	varies	varies	I, A, C
RCRA Metals		S,GW	varies	varies	A, IN

[1]Environmental Medium: Soil (S), Groundwater (GW)

[2]List the maximum concentration for each medium separately

[3]Use the lower of the two exposure limits (PEL/TLV)

[4]Cancer status; EPA Classification

Group A: Human carcinogen – Sufficient evidence to support a casual association between exposure and cancer.

Group B1: Probable Human Carcinogen – Limited evidence of carcinogenicity in humans

Group B2: Probable Human Carcinogen – Sufficient evidence of carcinogenicity in animals, inadequate evidence of carcinogenicity in humans.

Group C: Possible Human Carcinogen – Limited evidence of carcinogenicity in animals.

Group D: Not Classified – Inadequate evidence of carcinogenicity in animals.

Group E: No Evidence of Carcinogenicity in Humans – No evidence for carcinogenic in at least two adequate animal tests or in both epidemiologist and animal studies.

[5]Route: (I) – Inhalation, (A) – Skin absorption, (IN) – Ingestion, (C) – Eye/skin contact

2. The following chemical(s) may be/could be brought to the work site:

Fuel for equipment, sample preservatives (methanol, nitric acid, hydrochloric acid).

5.0 Physical Hazard Assessment

FLAMMABILITY/EXPLOSIVE

It is unlikely that explosive atmospheres will be encountered while performing tasks. However, it is possible that unknown chemicals may be encountered. Therefore, the following standard safety procedures will be implemented.

- All field vehicles and heavy equipment will be equipped with a type-ABC fire extinguisher. Fire extinguishers will be mounted on the vehicles where field personnel can easily access them. A fire extinguisher check, including inspection of gauges, hoses, and tanks, will be conducted before use of the field vehicle to ensure proper operation of the equipment.
- When necessary other appropriate firefighting equipment will be made available.
- Open fires and burning are prohibited. Smoking will be prohibited in all areas where flammable, combustible, or oxidizing materials are stored or are in use and any area containing unknown contaminants.

HEAVY EQUIPMENT

The hazards associated with the operation of heavy equipment can be effectively managed through adequate training and constant awareness. Any subcontractor equipment operators must have had the required training and must demonstrate the necessary skills for the piece of equipment they are operating. Constant visual and verbal contact should be maintained with the operator to facilitate awareness. Equipment will not obstruct roadways, walkways, electrical lines, etc. Proper distance from power lines should be observed. The operator and field personnel should be aware of loose soil or uneven terrain that cannot be driven over or parked on for sake of a roll-over hazard. All personnel working around heavy equipment will wear hard hats and safety-toed boots (at a minimum). Personnel should avoid turning their back to operating machinery.

EXCAVATIONS

Under no circumstances should an employee enter an un-shored excavation greater than 4 feet in depth. Shored excavations may also be considered confined spaces. A soil sample from excavations should be obtained from the backhoe bucket or other means if at all possible. Before entering an excavation the situations should be discussed with the project manager to assess confined space requirements (See Section 8).

SLIPS, TRIPS, AND FALLS

Although it can be difficult to prevent slips, trips, and fall hazards, these hazards can be minimized through good housekeeping, proper site-control measures, and keeping the work area free of obstructions. In the event that only one Stantec field person is on site, that person will inform the on-site subcontractors of where he/she will be working and ask them to accompany him/her for the work. Since it is virtually impossible to eliminate all slip, trip, and fall hazards in the Assessment Area, personnel should always be aware of the terrain they are walking across and have sure footing, taking very deliberate steps and the easiest path of travel. Cones and or caution tape will be used to mark identifiable hazards.

LIFTING

Field operations often require that physical labor tasks be performed. All employees should employ proper lifting procedures. Additionally, employees should not attempt to lift bulky or heavy objects (greater than 40 pounds) without assistance.

TOOLS AND EQUIPMENT

Hazards present during the use of tools and equipment are generally associated with improper tool handling and inadequate maintenance. Management of these hazards requires a rigorous maintenance of tools and equipment and effective training of employees in the proper use of these tools. Electrical cords must have unbroken insulation and should not be exposed to water or other liquids. A ground fault circuit interrupter outlet or cord must be used in any area where water may be present.

6.0 Personal Protective Equipment

Based on the waste (e.g., sludge, metals, and/or petroleum contamination in soil/groundwater) identified to potentially be at the site, it is concluded that there is likely minimal health risk to site personnel; therefore, Level D will be the required level for work at the site.

Levels A, B, and C are not anticipated for the project tasks. However, if site conditions change (e.g., unknown contaminants encountered, employee complaints, etc.) and a higher degree of protection is required, the SSO will consult the Project Manager and the required changes in personal protective equipment (PPE) will be made. A change in the level of PPE will result in this SHSP being amended and reviewed by the Project Manager.

PROJECT TASK	**LEVEL OF PROTECTION HAZ. WASTE & NON-HAZ. SITE (A, B, C, D, [OTHER SPECIFY BELOW])[1]**
Soil Sampling	Level D
Groundwater Sampling	Level D

See Attachment C for PPE description by level

7.0 Medical Requirements

Stantec personnel, whose presence may be required on a site where exposure to toxic and/or hazardous substances exists, shall be required to participate in any medical monitoring as deemed necessary by Stantec. All medical examinations performed for Stantec personnel shall be conducted in accordance with the requirements of 29 CFR 1910.120, 29 CFR 1910.134. In addition, it may be necessary to require specific clinical tests for certain sites. Any site-specific testing shall be identified below.

SITE-SPECIFIC CLINICAL TESTS PARAMETER	REQUIRED TESTING	ACTION LEVEL
N/A	N/A	N/A

All Stantec employees will be medically qualified and fit tested for respiratory protection as appropriate.

MEDICAL DATA SUMMARY

This form shall be completed by Stantec personnel prior to commencement of activities at the site. This form shall be kept at the project site for the duration of project activities. This form must be delivered to the attending physician when medical assistance is required.

Medical Data Summary Forms are provided in Attachment A

8.0 Training Requirements

All Stantec personnel participating in site investigations where exposure to toxic and/or hazardous substances is possible must complete at least 40 hours of health and safety training required by 29 CFR 1910.120. The dates of certification are documented in the following Stantec office:

Stantec
12075 Corporate Parkway Suite 200
Mequon WI 53092-2649
Contact: Mr. Jon Currie

CONFINED SPACE ENTRY

As a general rule, Stantec employees who are engaged in activities at sites covered by 29 CFR 1910.120 are prohibited from entering confined spaces. However, if it becomes absolutely necessary to enter a confined space to accomplish a required task, specific procedures will be established by the Stantec project manager and safety personnel on a task-by-task basis.

9.0 Environmental Monitoring

Service, maintenance, and calibration of monitoring equipment shall be performed in accordance with manufacturers' recommendations.

MONITORING EQUIPMENT CHECKLIST

TYPE OF EQUIPMENT	SERIAL NO.	WRITTEN SOP AVAILABLE	DATE CALIBRATED
Photoionization Detector (PID)	To Be Determined	Yes	Daily

SURVEILLANCE METHODS

The monitoring methods to be used at the project site are described below:

The breathing zone and work area will be periodically screened for volatile organic compounds (VOCs) using the PID and four-gas meter. If elevated VOCs are detected in the breathing zone or four-gas meter indicates a risk exists, Stantec staff will remove their persons from the work site, notify the project manager and evaluate appropriate actions (e.g. upgrade to Level C, etc.).

10.0 Site Safety Procedures

A site-specific/pre-entry meeting will be held before the start of any site activities in the Assessment Area. Additional meetings will be held as necessary. The purpose of these safety meetings is to:

- Describe the assigned tasks and their potential hazards.
- Coordinate activities.
- Identify methods and precautions to prevent injuries.
- Plan for emergencies.
- Describe any changes in the Site Safety Plan.
- Solicit worker feedback on conditions affecting safety and health.
- Solicit worker feedback on how well the Site Safety Plan is working.

Safety meetings will also be held at all other times necessary to ensure that all field personnel and visitors are aware of the health and safety hazards at the site. All field personnel and visitors will be required to attend these meetings. The on-site SSO or alternate designee will conduct the meetings.

The SSO will also conduct frequent inspections of site conditions, equipment, and activities to determine whether the SHSP is adequate and being followed. In order to make safety inspections effective, the following guidelines should be observed:

- Review the results of these inspections with supervisors and workers.
- Re-inspect any identified problems to ensure that they have been corrected.
- Document all inspections and subsequent follow-up actions in field notebook kept for this project. Retain these records until site activities are completed and at least 5 years after project has been completed.

The frequency of inspections shall be both at the beginning and the end of each work shift or when site conditions change due to factors such as weather, tasks are performed or new hazards being introduced on-site or discovered during site activities.

PERIMETER ESTABLISHMENT

The property lines of the target property will be used as the perimeter.

SITE ENTRY PROCEDURES

Before entering the site all personnel shall wear the required PPE and follow the decontamination procedures when exiting site.

SITE CONTROL AND DESIGNATION OF WORK ZONES

The following procedures shall be observed to minimize the potential for contaminant transfer, personnel exposure to hazardous materials and work place injury.

EXCLUSION ZONE

We do not plan to formally delineate the exclusion zone because of numerous and small work locations involved across the site over a relatively short period of time, and the limited likelihood of exposure to personnel other than those doing the actual work. The exclusion zone will be determined at each work location.

CONTAMINATION REDUCTION ZONE

We do not plan to formally delineate the contamination reduction zone because of numerous and small work locations involved across the site over a relatively short period of time, and the limited likelihood of exposure to personnel other than those doing the actual work. The contamination reduction zone will be determined at each work location.

SUPPORT ZONE

The support zone will consist of an area outside of the exclusion and contamination reduction zone where field vehicles and equipment will be staged. Eating, drinking, and smoking will only be allowed in this area.

11.0 Decontamination

All non-disposable field equipment will be decontaminated before each use and between samples to avoid cross-contamination between samples and to ensure the health and safety of the field crews. Field personnel must follow the procedures outlined below whenever leaving the exclusion areas. All decontamination procedures will be performed in accordance with the field standard operating procedure for *Equipment Decontamination* and *Management of Investigative Wastes Procedures* included in the Stantec (2015) *Quality Assurance Project Plan*.

PERSONNEL DECONTAMINATION PROCEDURES

Gloves will be placed in a plastic bag and disposed of properly. Re-usable PPE will be decontaminated with an appropriate detergent wash and rinsed with water. Decontamination water will be containerized and disposed of properly.

SAMPLING/MONITORING EQUIPMENT DECONTAMINATION PROCEDURES

Disposable equipment will be placed in a garbage bag and disposed of properly. Re-usable equipment will be washed and scrubbed with an appropriate detergent wash and rinsed with water. Equipment will be decontaminated after each sampling event to prevent cross contamination. Decontamination water will be containerized and disposed of properly.

12.0 Emergency Plan

This emergency action plan can be fully or partially activated depending on the extent of the encountered incident. The plan will be activated whenever an emergency is discovered. Where possible, the emergency will be brought under control by the on-site personnel. The on-site SSO has full responsibility in the event of an emergency and will be required to determine if outside response needs to be contacted.

The personnel who have responsibilities in the event of an emergency are listed below with their area(s) of responsibility. In addition, procedures to be followed in the event of a site evacuation are also outlined.

EMERGENCY PERSONNEL RESPONSIBILITIES

NAME	RESPONSIBILITY
Nick Heim	Site-Safety Officer
Andy Swaim	Site-Safety Officer
Chris Hatfield	Site-Safety Officer

The SSO is the on-site emergency coordinator who has the responsibility for controlling emergency response operations at the site. In the event of an emergency, the SSO must identify, as best as possible, all hazardous substances or conditions present. She/he must implement appropriate emergency operations in accordance with this plan. In addition, she/he must limit the number of personnel exposed to the emergency, by communicating with all personnel on-site and assuring they get to a safe area.

COMMUNICATION

Before starting field activities, the appropriate representatives of Washington County and the City of West Bend will be notified of the planned activities. Stantec will review the SHSP and Emergency Plan with Washington County and the City of West Bend representatives to inform them of potential emergencies related to the field activities at the site.

If an emergency occurs, fast and effective communication is essential. Without proper communication, the ability to initiate and carry out an appropriate response could be severely hindered. There are three important elements to effective communications. First, the appropriate message to be communicated must be determined. Second, the message then must be transmitted correctly. Finally, the person receiving the message must understand the message onsite. Communication will be accomplished through direct-voice contact, two-way radio dispatch, and cell phones. The SSO will have a cell phone either on person or in the field vehicle at all times while performing tasks at the Site.

In the event of an emergency, the SSO will contact off-site first responders or transport the victim to the hospital following the evacuation/hospital route found in this SHSP. If victim is in distress, 911 can be called immediately by the individual who discovers the emergency. Outside medical assistance should be requested if any of the following conditions occur.

- Cardiac Arrest
- Chest Pain
- Breathing Difficulty
- Burns (2nd or 3rd degree over 10 percent of the body or about the face or neck)
- Diabetic Emergency
- Drug Overdose
- Hypertension
- Multiple Trauma
- Seizure
- Smoke, Heat or Toxic Gas Inhalation
- Uncontrollable Bleeding

Emergency eye wash bottles will be kept in field vehicles in case of any eye emergencies requiring immediate flushing of the eyes to prevent permanent damage to the person's sight. If outside assistance is required, immediately dial 911. Call from a safe area. The following information should be given.

- Inform the dispatcher of the emergency
- Identify yourself
- Indicate if someone is injured
- Describe how to get to the area of emergency

After making the call, evacuate victims to safe area if they can be moved and wait to meet the responders.

EMERGENCY PROCEDURES

INJURY

- All site personnel shall assemble at the decontamination line.
- The SSO shall evaluate the nature of injury and contact outside emergency services if needed.
- Move victim to contamination reduction zone if can be moved.
- Perform emergency decontamination procedures (section below) on victim.
- Transport victim to hospital if needed or inform outside emergency personnel of situation and designated medical facility.
- No persons shall re-enter the Exclusion Zone until the cause of the injury (or symptoms) is determined.
- Perform an accident investigation using Attachment B (Incident Report Sheet).

DECONTAMINATION DURING MEDICAL EMERGENCIES

If emergency life-saving first aid and/or medical treatment are required, decontamination procedures may be limited or omitted. If the contamination does not present a hazard to the rescue personnel, life-saving care may be instituted immediately. If contamination will present a risk to rescue personnel, minimal decontamination should be performed to allow initiation of aid.

If contamination presents a significant risk to rescue personnel, then decontamination will need to be performed until the contamination is no longer a risk.

Medical assistance personnel will be notified before transporting the victim if the victim may be contaminated. Assurance must be made that the medical personnel at the

receiving area are able and willing to handle a victim who is contaminated. Site personnel will accompany contaminated victim to the medical facility to advice on matters involving decontamination. A copy of this SHSP, including materials safety data sheets (MSDS) (if known), will be brought along with the victim.

Heat-related illnesses range from heat fatigue to heat stroke. Heat stroke requires prompt treatment to prevent irreversible damage or death. Protective clothing must be promptly removed. Less serious forms of heat stress also require prompt attention. Unless the victim is obviously contaminated, decontamination may be omitted or minimized and treatment should begin immediately.

FIRE/EXPLOSION

If fire or explosions occur in the Assessment Area, the following actions will be performed.

- Any personnel who discover a fire should immediately notify 911 to request assistance.
- On-site personnel, under the direction of the SSO, will attempt to control or extinguish fire with fire extinguisher, if possible.
- A 10-second air horn blast shall be sounded.
- All site personnel not involved with fighting the fire shall assemble at the decontamination line.
- Evacuation of the affected area may be necessary in case of major fire or explosion. All personnel will be familiar with excavation procedures and means of exit from their work areas.
- Emergency Response officials will determine the appropriate actions for off-site response actions.

UNKNOWN INTACT DRUMS

It is not anticipated that unknown intact drums will be encountered during the assessment activities, however, if encountered; the following steps will be performed.

- The drum will first be inspected from the surface by the SSO. The SSO will be looking for the following items:
  - Symbols, words or other marks on the drum indicating that its contents are hazardous (e.g., radioactive, explosive, corrosive, toxic or flammable)
  - Symbols, words or other marks on the drum indicating that it contains discarded laboratory chemicals, reagents, or potentially dangerous materials in small volume individual containers
  - Evidence of deterioration such as corrosion, rust, and leaks
  - Evidence that the drum is under pressure such as swelling and bulging
  - Drum type and drum lid
- After surface inspection of the drum, investigative activities will cease, and the drum will remain intact.

SPILL/RELEASE

If a spill or release occurs, the following steps will be performed.

- Report it immediately to the SSO.
- All personnel shall then re-locate upwind and upgradient of the spill to a safe distance (e.g., 1000 feet).

- SSO will assess the spill and inform the drilling contractor to put absorbent material down to try to contain the spill if possible.
- If spill or release cannot be contained and/or cannot be safely characterized, a 10-second blast shall be sounded and all personnel shall be evacuated immediately to the decontamination line.
- Then a safe distance away, upwind and upgradient of spill.
- SSO will contact the site hazardous material spill response contractor and inform them about the spill/release and to coordinate spill cleanup.
- The SSO will contact the Washington County emergency response personnel and the Wisconsin Department of Natural Resources.

The SSO will coordinate with the spill release contractor and determine through the SSO's/spill contractor's professional opinion if there is a threat to the neighboring community. Should the neighboring community require evacuation; the SSO will contact the local authorities, inform them of the situation, and ask that they contact the affected receptors.

ADVERSE WEATHER CONDITIONS

If the SSO is notified of adverse weather conditions, the following steps shall be performed.

- The SSO will determine if work can continue without endangering the health and safety of the field workers. The SSO will monitor the weather during the a.m. and p.m. hours and will document it in the field logbook. Some of the items to be considered before determining the continuance of work are:
  - Potential for heat stress and heat related injuries
  - Potential for cold stress and frostbite related injuries
  - Dangerous weather related working conditions (high winds)
  - Limited Visibility
  - Potential for electrical storms/lightning. No activities will be permitted during electrical storms
  - Tornado watches and warnings. No activities will be permitted during a tornado warning
  - Winter weather watches and warnings. No activities will be permitted during a snow storm.

In the event of a weather emergency:

- Take appropriate cover in either nearby buildings or vehicles depending on the emergency.
- Work will cease until the conditions clear up and all watches/warnings are lifted.

GENERAL SITE EVACUATION PROCEDURES

Exit exclusion zone, contaminant reduction zone, and support zone. Contact emergency services (911) if necessary.

First Aid procedures for a variety of situations are included in Attachment D.

13.0 Emergency References

EMERGENCY RESOURCES

* Ambulance	**911**
* Hospital Emergency Center	**(262) 836-7300**
* Hospital Life Line	NA
* Hospital Poison Center	NA
* Local Police	**911**
* County Sheriff	**911**
* State Police	**911**
* Fire Department	**911**
* Explosives Disposal Unit	NA
* Radio Channel	NA

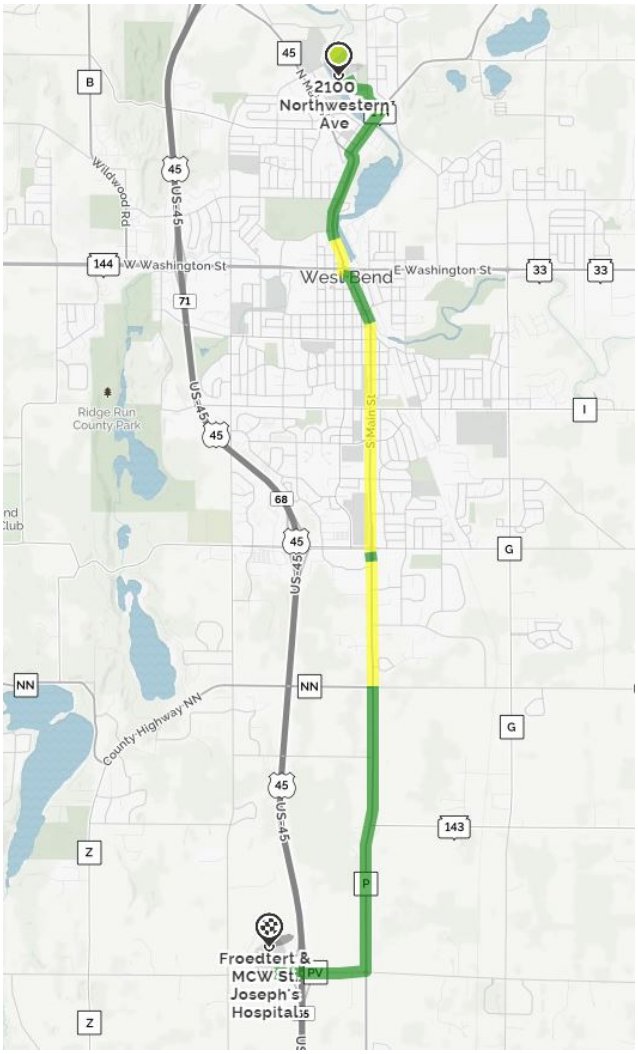
OTHER EMERGENCY CONTACTS

* Stantec Office	(800) 880-4700
* Client (Washington County)	(262) 335-4445
* City of West Bend	(262) 335-5171
* National Response Center	(800) 424-8802
* WI Emergency Government	(800) 943-0003

Note: Incident reports are provided in Attachment B.

14.0 Evacuation/Hospital Routes

From 2100 Northwestern Avenue to St. Joseph's Health Center



Driving directions from 2100 Northwestern Avenue to St. Joseph's Health Center, 3200 Pleasant Valley Road, West Bend, Wisconsin

Start of next leg of route

Start out going **southeast** on **Northwestern Ave** toward **Hi Mount Rd**.

Then 0.11 miles

Take the 1st **left** onto **Hi Mount Rd**.

Then 0.09 miles

Turn **right** onto **Salisbury Rd**.

Then 0.20 miles

Take the 2nd **right** onto **Barton Ave/WI-144**.

Barton Ave is just past Monroe St.

If you are on Schmidt Rd and reach Oakfield St you've gone about 0.6 miles too far.

Then 0.38 miles

Turn **left** onto **N Main St/US-45 Bus N/WI-144**. Continue to follow **US-45 Bus N**.

US-45 Bus N is just past Jefferson St.

If you are on Barton Ave and reach Fond du Lac St you've gone a little too far.

Then 0.94 miles

Turn **left** onto **Cedar St/US-45 Bus N**.

Cedar St is just past W Washington St.

Schmidt Funeral Home is on the corner.

If you are on N 7th Ave and reach Elm St you've gone a little too far.

Then 0.05 miles

Turn **right** onto **N Main St/US-45 Bus N**.

Tastings Food & Spirits is on the corner.

Then 0.26 miles

Enter next roundabout and take the 1st exit onto **S Main St**.

Then 2.43 miles

S Main St becomes **County Hwy-P**.

Then 2.34 miles

Enter next roundabout and take the 1st exit onto **Pleasant Valley Rd**.

Then 0.68 miles

Froedtert & MCW St. Joseph's Hospital, **3200 PLEASANT VALLEY RD**.

Your destination is 0.6 miles past County Hwy-P.

If you reach Mayfield Rd you've gone about 0.3 miles too far.

15.0 Site-Specific Health and Safety Plan Review

This document shall be signed by site personnel prior to their first site visit.

"I have read and understand the contents of this Site Safety Plan and will comply with its provisions, requirements, and restrictions."

NAME (PRINT)	SIGNATURE	DATE

16.0 Site-Specific Health and Safety Plan Follow-Up Report

Project Site: _____

1. Was the Site Health and Safety Plan followed?

   _____ Yes _____ No

2. If no, explain all changes to the Site Health and Safety Plan:

3. Reason for changes:

4. Report prepared by: _____ Date: _____

5. Report reviewed by: _____ Date: _____

17.0 Addendum to Site-Specific Health and Safety Plan

Use this page to add additional site data or describe any special circumstances that have become apparent after the original preparation of this Site Health and Safety Plan. Include any changes in site conditions, PPE and monitoring modifications and other items as appropriate.

Attachment A – Medical Data Summary Forms

MEDICAL DATA SUMMARY FORM:

This form shall be completed by Stantec personnel prior to commencement of activities of the site. This form shall be kept at the project site for the duration of project activities. This form must be delivered to the attending physician when medical assistance is required.

Site: _____

Location: _____

Name: _____

Address: _____

Home Phone: _____

Height: _____ Weight: _____ Age: _____ Sex: ___

In case of emergency contact: _____

Address: _____

_____

Phone (_____)_____

Allergies: _____

_____

Recent Illnesses: _____

_____

Previous exposure to hazardous substances?

_____ Yes _____ No

Current medication: _____

Medical restrictions: _____

_____

Name of personal physician: _____

Address: _____

_____

Phone: (_____)_____

Date Completed: _____

Attachment B – Incident Report Sheets

INCIDENT REPORT

Project #:_____

Site: _____

Location: _____

Name of Affected Individual: _____

Address: _____

Age: _____ Sex: _____

Description of Incident: _____

Date of Incident: _____ Time of Incident: _____

Was Medical Care Required? ☐ YES ☐ NO

Immediate Family Notified? ☐ YES ☐ NO

If Yes, Describe Care Received (attach medical record): _____

Date Care Received: _____ Location: _____

Future Preventative Measures/Corrective Action Taken: _____

_____

_____

_____

Report Prepared By: _____ Date: _____

Report Reviewed By: _____ Date: _____

Attachment C – Personal Protective Equipment

PERSONAL PROTECTIVE EQUIPMENT (PPE)

1. Level A protection should be selected when the highest level of respiratory, skin, eye, and mucous membrane protection is needed.
   - Positive-pressure, self-contained, breathing apparatus (MSHA/NIOSH approved) **(REQUIRED)**
   - Fully encapsulated, chemical resistant suit **(REQUIRED)**
   - Chemical-resistant inner and outer gloves **(REQUIRED)**
   - Chemical-resistant boots with steel toe and shank **(REQUIRED)**
   - Chemical-resistant coveralls
   - Two-way radio communication **(REQUIRED)**
2. Level B protection should be selected when the highest level of respiratory protection is needed, but with a lesser degree of skin and eye protection.
   - Positive-pressure, self-contained, breathing apparatus (MSHA/NIOSH approved) **(REQUIRED)**
   - Chemical-resistant clothing (coveralls, hooded two-piece, chemical resistant splash suit, or disposable chemical-resistant coveralls) **(REQUIRED)**
   - Coveralls (under splash suit)
   - Chemical-resistant inner and outer gloves **(REQUIRED)**
   - Chemical-resistant boots with steel toe and shank **(REQUIRED)**
   - Two-way radio communication
   - Hard hat **(REQUIRED)**
3. Level C protection should be selected when the type and concentration of hazardous airborne substance is known, the criteria for using air-purifying respirators is met, and skin and eye exposure is unlikely. Monitoring of the air must be performed to comply with OSHA regulations and to ensure respirator effectiveness.
   - Full face, air purifying respirator (MSHA/NIOSH approved) with appropriate cartridges **(REQUIRED)**
   - Chemical-resistant clothing (coveralls, hooded two-piece, chemical resistant splash suit, or disposable chemical-resistant coveralls) **(REQUIRED)**
   - Chemical-resistant inner and outer gloves **(REQUIRED)**
   - Chemical-resistant boots with steel toe and shank **(REQUIRED)**
   - Two-way radio communication
   - Hard hat **(REQUIRED)**
   - Escape respirator
4. Level D is primarily a work uniform. It shall not be worn on-site where respiratory or skin hazards exist.
   - Protective coveralls and protective gloves **(REQUIRED)**
   - Boots with steel toe and shank **(REQUIRED)**
   - Hard hat **(REQUIRED, when applicable)**
   - Safety glasses **(REQUIRED)**
   - Safety vest **(REQUIRED)**

Attachment D – First Aid

FIRST AID

BITES

ANIMAL BITES

Thoroughly wash the wound with soap and water, flush the area with running water, and apply a sterile dressing. Immobilize affected part until the victim has been attended by a physician. See that the animal is kept alive and in quarantine. Obtain the name and address of the owner of the animal.

INSECT BITES:

Remove "stinger" without squeezing if present; keep affected part below the level of the heart; and apply ice bag. For minor bites and stings, apply soothing lotions such as calamine.

BURNS AND SCALDS

MINOR BURNS:

DO NOT APPLY VASELINE OR GREASE OF ANY KIND. If there are no areas of open skin, apply cold water until pain subsides; cover with a dry, sterile dressing. Do not break blisters or remove tissue. Seek medical attention.

SEVERE BURNS:

Do not remove adhered particles of clothing. Do not apply ice or immerse in water. Do not apply any ointments or grease. Cover burns with thick, sterile dressings. Keep burned feet or legs elevated if possible. May need to treat for shock.

CHEMICAL BURNS:

Wash away the chemical soaked clothing with large amounts of water. Remove victim's chemical-soaked clothing. If dry lime, brush away before flushing. Apply sterile dressing and seek medical attention.

CRAMPS

SYMPTOMS:

Muscle cramps in abdomen and extremities. Heat exhaustion may also be present.

TREATMENT:

Same as for heat exhaustion.

CUTS

Apply pressure with sterile gauze dressing and elevate the area until bleeding stops. Apply bandage and seek medical attention.

EYES

FOREIGN OBJECTS:

Keep the victim from rubbing eyes and flush the eye with water. If flushing fails to remove the object, apply a dry protective dressing to both eyes and seek medical attention.

CHEMICALS:

Flood the eye thoroughly with water for 15 minutes. Cover the eye with a dry sterile pad and seek medical attention.

FAINTING

Keep the victim lying down. Loosen tight clothing. If victim vomits, roll person onto side or turn head to the side. Maintain an open airway. Bathe the person's face gently with cool water. Unless recovery is prompt, seek medical attention.

FRACTURES

Deformity of an injured part usually means a fracture. If a fracture is suspected, splint the part. DO NOT ATTEMPT TO MOVE THE VICTIM. Seek medical attention immediately.

FROSTBITE

SYMPTOMS:

Just before frostbite occurs, skin may be flushed then changes to white or grayish-yellow. Pain may be felt early; then may subside. Blisters may appear; affected part feels very cold and/or may be numb.

TREATMENT:

Bring victim indoors, cover the frozen area; provide extra clothing and blankets. Re-warm frozen area quickly by immersion in warm water—NOT HOT WATER. DO NOT RUB THE PART. Seek medical attention.

HEAT EXHAUSTION

Caused by exposure to heat, either sun or indoor.

SYMPTOMS:

Near-normal body temperature; pale and clammy skin; profuse sweating, tiredness, weakness, headache, perhaps cramps, nausea, dizziness, and possible fainting.

TREATMENT:

Keep victim in lying position and raise feet. Loosen clothing, apply cool wet cloths. If conscious, give sips of water. Seek medical attention immediately.

SUNSTROKE

SYMPTOMS:

High body temperature; hot, red, and dry skin; rapid pulse. Victim may be unconscious.

TREATMENT:

Keep victim in lying position with head elevated. Remove clothing and repeatedly sponge the bare skin with cool water. Seek medical attention immediately.

POISONING

Call the Poison Control Center for instruction on immediate care. If victim becomes unconscious, keep the airway open. If breathing stops, begin rescue breathing. Call Emergency Medical Services (EMS) immediately.

POISON IVY

Remove contaminated clothing. Wash all exposed areas thoroughly with soap and water. If rash is mild, apply calamine lotion or other soothing skin lotion. If a severe reaction occurs, seek medical attention.

PUNCTURE WOUNDS

If puncture wounds is deeper than skin surface, seek medical attention. Serious infection can occur unless proper treatment is received.

SPRAINS

Elevate injured part and apply ice bag or cold packs. Do not soak in hot water. Immobilize affected part and seek medical attention.

UNCONSCIOUSNESS

Never attempt to give anything by mouth. Keep victim lying flat, maintain open airway. If victim is not breathing, perform rescuer breathing and call EMS immediately.

Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909
US GHS

Synonyms: Ultra Low Sulfur Diesel; Low Sulfur Diesel; No. 2 Diesel; Motor Vehicle Diesel Fuel; Non-Road Diesel Fuel; Locomotive/Marine Diesel Fuel

* * * Section 1 - Product and Company Identification * * *

Manufacturer Information

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

Phone: 732-750-6000 Corporate EHS
Emergency # 800-424-9300 CHEMTREC
www.hess.com (Environment, Health, Safety Internet Website)

* * * Section 2 - Hazards Identification * * *

GHS Classification:

Flammable Liquids - Category 3
Skin Corrosion/Irritation – Category 2
Germ Cell Mutagenicity – Category 2
Carcinogenicity - Category 2
Specific Target Organ Toxicity (Single Exposure) - Category 3 (respiratory irritation, narcosis)
Aspiration Hazard – Category 1
Hazardous to the Aquatic Environment, Acute Hazard – Category 3

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

DANGER

Hazard Statements

Flammable liquid and vapor.
Causes skin irritation.
Suspected of causing genetic defects.
Suspected of causing cancer.
May cause respiratory irritation.
May cause drowsiness or dizziness.
May be fatal if swallowed and enters airways.
Harmful to aquatic life.

Precautionary Statements

Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking
Keep container tightly closed.
Ground/bond container and receiving equipment.

Use explosion-proof electrical/ventilating/lighting/equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Wear protective gloves/protective clothing/eye protection/face protection.
Wash hands and forearms thoroughly after handling.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Avoid breathing fume/mist/vapours/spray.

Response
In case of fire: Use water spray, fog or foam to extinguish.
IF ON SKIN (or hair): Wash with plenty of soap and water. Remove/Take off immediately all contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical advice/attention.
IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a poison center/doctor if you feel unwell.
If swallowed: Immediately call a poison center or doctor. Do NOT induce vomiting.
IF exposed or concerned: Get medical advice/attention.

Storage
Store in a well-ventilated place. Keep cool.
Keep container tightly closed.
Store locked up.

Disposal
Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 3 - Composition / Information on Ingredients * * *

CAS #	Component	Percent
68476-34-6	Fuels, diesel, no. 2	100
91-20-3	Naphthalene	<0.1

A complex mixture of hydrocarbons with carbon numbers in the range C9 and higher.

* * * Section 4 - First Aid Measures * * *

First Aid: Eyes
In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

First Aid: Skin
Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or with waterless hand cleanser. Obtain medical attention if irritation or redness develops. Thermal burns require immediate medical attention depending on the severity and the area of the body burned.

First Aid: Ingestion
DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

First Aid: Inhalation

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

* * * Section 5 - Fire Fighting Measures * * *

General Fire Hazards

See Section 9 for Flammability Properties.

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, and other gaseous agents.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Unsuitable Extinguishing Media

None

Fire Fighting Equipment/Instructions

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment. Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

* * * Section 6 - Accidental Release Measures * * *

Recovery and Neutralization

Carefully contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Caution, flammable vapors may accumulate in closed containers.

Emergency Measures

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Personal Precautions and Protective Equipment

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Prevention of Secondary Hazards

None

* * * Section 7 - Handling and Storage * * *

Handling Procedures

Handle as a combustible liquid. Keep away from heat, sparks, excessive temperatures and open flame! No smoking or open flame in storage, use or handling areas. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents."

Storage Procedures

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks."

Incompatibilities

Keep away from strong oxidizers.

* * * Section 8 - Exposure Controls / Personal Protection * * *

Component Exposure Limits

Fuels, diesel, no. 2 (68476-34-6)

ACGIH: 100 mg/m3 TWA (inhalable fraction and vapor, as total hydrocarbons, listed under Diesel fuel)
Skin - potential significant contribution to overall exposure by the cutaneous route (listed under Diesel fuel)

Naphthalene (91-20-3)

ACGIH: 10 ppm TWA
15 ppm STEL
Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA: 10 ppm TWA; 50 mg/m3 TWA
NIOSH: 10 ppm TWA; 50 mg/m3 TWA
15 ppm STEL; 75 mg/m3 STEL

Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

Personal Protective Equipment: Respiratory

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Personal Protective Equipment: Hands

Gloves constructed of nitrile, neoprene, or PVC are recommended.

Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Personal Protective Equipment: Skin and Body

Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

* * * Section 9 - Physical & Chemical Properties * * *

Appearance:	Clear, straw-yellow.	**Odor:**	Mild, petroleum distillate odor
Physical State:	Liquid	**pH:**	ND
Vapor Pressure:	0.009 psia @ 70 °F (21 °C)	**Vapor Density:**	>1.0
Boiling Point:	320 to 690 °F (160 to 366 °C)	**Melting Point:**	ND
Solubility (H2O):	Negligible	**Specific Gravity:**	0.83-0.876 @ 60°F (16°C)
Evaporation Rate:	Slow; varies with conditions	**VOC:**	ND
Percent Volatile:	100%	**Octanol/H2O Coeff.:**	ND
Flash Point:	>125 °F (>52 °C) minimum	**Flash Point Method:**	PMCC
Upper Flammability Limit (UFL):	7.5	**Lower Flammability Limit (LFL):**	0.6
Burning Rate:	ND	**Auto Ignition:**	494°F (257°C)

* * * Section 10 - Chemical Stability & Reactivity Information * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources.

Incompatible Products

Keep away from strong oxidizers.

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

* * * Section 11 - Toxicological Information * * *

Acute Toxicity

A: General Product Information

Harmful if swallowed.

B: Component Analysis - LD50/LC50

Naphthalene (91-20-3)

Inhalation LC50 Rat >340 mg/m3 1 h; Oral LD50 Rat 490 mg/kg; Dermal LD50 Rat >2500 mg/kg; Dermal LD50 Rabbit >20 g/kg

Potential Health Effects: Skin Corrosion Property/Stimulativeness

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

Potential Health Effects: Eye Critical Damage/ Stimulativeness

Contact with eyes may cause mild irritation.

Potential Health Effects: Ingestion

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

Potential Health Effects: Inhalation

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

Respiratory Organs Sensitization/Skin Sensitization

This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity

This material has been positive in a mutagenicity study.

Carcinogenicity

A: General Product Information

Suspected of causing cancer.

Studies have shown that similar products produce skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

B: Component Carcinogenicity

Fuels, diesel, no. 2 (68476-34-6)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans (listed under Diesel fuel)

Naphthalene (91-20-3)

ACGIH: A4 - Not Classifiable as a Human Carcinogen
NTP: Reasonably Anticipated To Be A Human Carcinogen (Possible Select Carcinogen)
IARC: Monograph 82 [2002] (Group 2B (possibly carcinogenic to humans))

Reproductive Toxicity

This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure

This product is not reported to have any specific target organ general toxicity single exposure effects.

Specified Target Organ General Toxicity: Repeated Exposure

This product is not reported to have any specific target organ general toxicity repeat exposure effects.

Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

* * * Section 12 - Ecological Information * * *

Ecotoxicity

A: General Product Information

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

Fuels, diesel, no. 2 (68476-34-6)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	35 mg/L [flow-through]	

Naphthalene (91-20-3)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	5.74-6.44 mg/L [flow-through]	
96 Hr LC50 Oncorhynchus mykiss	1.6 mg/L [flow-through]	
96 Hr LC50 Oncorhynchus mykiss	0.91-2.82 mg/L [static]	
96 Hr LC50 Pimephales promelas	1.99 mg/L [static]	

96 Hr LC50 Lepomis macrochirus	31.0265 mg/L [static]
72 Hr EC50 Skeletonema costatum	0.4 mg/L
48 Hr LC50 Daphnia magna	2.16 mg/L
48 Hr EC50 Daphnia magna	1.96 mg/L [Flow through]
48 Hr EC50 Daphnia magna	1.09 - 3.4 mg/L [Static]

Persistence/Degradability
No information available.

Bioaccumulation
No information available.

Mobility in Soil
No information available.

* * * Section 13 - Disposal Considerations * * *

Waste Disposal Instructions
See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

Disposal of Contaminated Containers or Packaging
Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 14 - Transportation Information * * *

DOT Information
Shipping Name: Diesel Fuel
NA #: 1993 **Hazard Class:** 3 **Packing Group:** III
Placard:

* * * Section 15 - Regulatory Information * * *

Regulatory Information

Component Analysis

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

Naphthalene (91-20-3)

CERCLA: 100 lb final RQ; 45.4 kg final RQ

SARA Section 311/312 – Hazard Classes

Acute Health	Chronic Health	Fire	Sudden Release of Pressure	Reactive
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product may contain listed chemicals below the de minimis levels which therefore are not subject to the supplier notification requirements of Section 313 of the Emergency Planning and Community Right- To-Know Act (EPCRA) of 1986 and of 40 CFR 372. If you may be required to report releases of chemicals listed in 40 CFR 372.28, you may contact Hess Corporate Safety if you require additional information regarding this product.

State Regulations

Component Analysis - State

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
Fuels, diesel, no. 2	68476-34-6	No	No	No	Yes	No	No
Naphthalene	91-20-3	Yes	Yes	Yes	Yes	Yes	No

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.

Component Analysis - WHMIS IDL

No components are listed in the WHMIS IDL.

Additional Regulatory Information

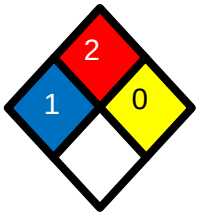
Component Analysis - Inventory

Component	CAS #	TSCA	CAN	EEC
Fuels, diesel, no. 2	68476-34-6	Yes	DSL	EINECS
Naphthalene	91-20-3	Yes	DSL	EINECS

* * * Section 16 - Other Information * * *

NFPA® Hazard Rating

Health	1
Fire	2
Reactivity	0



HMIS® Hazard Rating

Health	1*	Slight
Fire	2	Moderate
Physical	0	Minimal
		*Chronic

Key/Legend

ACGIH = American Conference of Governmental Industrial Hygienists; ADG = Australian Code for the Transport of Dangerous Goods by Road and Rail; ADR/RID = European Agreement of Dangerous Goods by Road/Rail; AS = Standards Australia; DFG = Deutsche Forschungsgemeinschaft; DOT = Department of Transportation; DSL = Domestic Substances List; EEC = European Economic Community; EINECS = European Inventory of Existing Commercial Chemical Substances; ELINCS = European List of Notified Chemical Substances; EU = European Union; HMIS = Hazardous Materials Identification System; IARC = International Agency for Research on Cancer; IMO = International Maritime Organization; IATA = International Air Transport Association; MAK = Maximum Concentration Value in the Workplace; NDSL = Non-Domestic Substances List; NFPA = National Fire Protection Association; NOHSC = National Occupational Health & Safety Commission; NTP = National Toxicology Program; STEL = Short-term Exposure Limit; TDG = Transportation of Dangerous Goods; TLV = Threshold Limit Value; TSCA = Toxic Substances Control Act; TWA = Time Weighted Average

Literature References

None

Other Information

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

End of Sheet

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

EMERGENCY OVERVIEW
DANGER!
EXTREMELY FLAMMABLE - EYE AND MUCOUS MEMBRANE IRRITANT - EFFECTS CENTRAL NERVOUS SYSTEM - HARMFUL OR FATAL IF SWALLOWED - ASPIRATION HAZARD

NFPA 704 (Section 16)

High fire hazard. Keep away from heat, spark, open flame, and other ignition sources.

If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs). Contact may cause eye, skin and mucous membrane irritation. Harmful if absorbed through the skin. Avoid prolonged breathing of vapors or mists. Inhalation may cause irritation, anesthetic effects (dizziness, nausea, headache, intoxication), and respiratory system effects.

Long-term exposure may cause effects to specific organs, such as to the liver, kidneys, blood, nervous system, and skin. Contains benzene, which can cause blood disease, including anemia and leukemia.

1. CHEMICAL PRODUCT and COMPANY INFORMATION

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs): **CHEMTREC (800)424-9300**
COMPANY CONTACT (business hours): Corporate Safety (732)750-6000
MSDS (Environment, Health, Safety) Internet Website www.hess.com

SYNONYMS: Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and INFORMATION ON INGREDIENTS *

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Gasoline (86290-81-5)	100
Benzene (71-43-2)	0.1 - 4.9 (0.1 - 1.3 reformulated gasoline)
n-Butane (106-97-8)	< 10
Ethyl Alcohol (Ethanol) (64-17-5)	0 - 10
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Tertiary-amyl methyl ether (TAME) (994-05-8)	0 to 17.2
Toluene (108-88-3)	1 - 25
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 - 15

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol or MTBE and/or TAME).

Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

3. HAZARDS IDENTIFICATION

EYES
Moderate irritant. Contact with liquid or vapor may cause irritation.

SKIN
Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

INGESTION
The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

INHALATION
Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY
Contains benzene, a regulated human carcinogen. Benzene has the potential to cause anemia and other blood diseases, including leukemia, after repeated and prolonged exposure. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with systemic toxicity. See also Section 11 - Toxicological Information.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash). Chronic respiratory disease, liver or kidney dysfunction, or pre-existing central nervous system disorders may be aggravated by exposure.

4. FIRST AID MEASURES

EYES
In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN
Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION
Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT:	-45 ^{o}F (-43^{o}C)
AUTOIGNITION TEMPERATURE:	highly variable; > 530 ^{o}F (>280 ^{o}C)
OSHA/NFPA FLAMMABILITY CLASS:	1A (flammable liquid)
LOWER EXPLOSIVE LIMIT (%):	1.4%
UPPER EXPLOSIVE LIMIT (%):	7.6%

FIRE AND EXPLOSION HAZARDS
Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA
SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

During certain times of the year and/or in certain geographical locations, gasoline may contain MTBE and/or TAME. Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration - refer to NFPA 11 “Low Expansion Foam - 1994 Edition.”

FIRE FIGHTING INSTRUCTIONS
Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES

ACTIVATE FACILITY SPILL CONTINGENCY or EMERGENCY PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE

HANDLING PRECAUTIONS

******USE ONLY AS A MOTOR FUEL******
******DO NOT SIPHON BY MOUTH******

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION

EXPOSURE LIMITS

Component (CAS No.)	Source	TWA (ppm)	STEL (ppm)	Exposure Limits Note
Gasoline (86290-81-5)	ACGIH	300	500	A3
Benzene (71-43-2)	OSHA	1	5	Carcinogen
	ACGIH	0.5	2.5	A1, skin
	USCG	1	5	
n-Butane (106-97-8)	ACGIH	1000	--	Aliphatic Hydrocarbon Gases Alkane (C1-C4)
Ethyl Alcohol (ethanol) (64-17-5)	OSHA	1000	--	
	ACGIH	1000	--	A4
Ethyl benzene (100-41-4)	OSHA	100	--	
	ACGIH	100	125	A3
n-Hexane (110-54-3)	OSHA	500	--	
	ACGIH	50	--	Skin
Methyl-tertiary butyl ether [MTBE] (1634-04-4)	ACGIH	50		A3
Tertiary-amyl methyl ether [TAME] (994-05-8)				None established
Toluene (108-88-3)	OSHA	200		Ceiling: 300 ppm; Peak: 500 ppm (10 min.)
	ACGIH	20	--	A4
1,2,4- Trimethylbenzene (95-63-6)	ACGIH	25	--	
Xylene, mixed isomers (1330-20-7)	OSHA	100	--	
	ACGIH	100	150	A4

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile or neoprene are recommended. Chemical protective clothing such as that made of of E.I. DuPont Tychem ®, products or equivalent is recommended based on degree of exposure.

Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

RESPIRATORY PROTECTION

A NIOSH-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES

APPEARANCE

A translucent, straw-colored or light yellow liquid

ODOR
A strong, characteristic aromatic hydrocarbon odor. Oxygenated gasoline with MTBE and/or TAME may have a sweet, ether-like odor and is detectable at a lower concentration than non-oxygenated gasoline.

ODOR THRESHOLD

	Odor Detection	Odor Recognition
Non-oxygenated gasoline:	0.5 - 0.6 ppm	0.8 - 1.1 ppm
Gasoline with 15% MTBE:	0.2 - 0.3 ppm	0.4 - 0.7 ppm
Gasoline with 15% TAME:	0.1 ppm	0.2 ppm

BASIC PHYSICAL PROPERTIES

BOILING RANGE:	85 to 437 ^{o}F (39 to 200 ^{o}C)
VAPOR PRESSURE:	6.4 - 15 RVP @ 100 ^{o}F (38 ^{o}C) (275-475 mm Hg @ 68 ^{o}F (20 ^{o}C)
VAPOR DENSITY (air = 1):	AP 3 to 4
SPECIFIC GRAVITY (H_2O = 1):	0.70 – 0.78
EVAPORATION RATE:	10-11 (n-butyl acetate = 1)
PERCENT VOLATILES:	100 %
SOLUBILITY (H_2O):	Non-oxygenated gasoline - negligible (< 0.1% @ 77 ^{o}F). Gasoline with 15% MTBE - slight (0.1 - 3% @ 77 ^{o}F); ethanol is readily soluble in water

10. STABILITY and REACTIVITY)

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID
Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources

INCOMPATIBLE MATERIALS
Keep away from strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS
Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

11. TOXICOLOGICAL PROPERTIES

ACUTE TOXICITY
Acute Dermal LD50 (rabbits): > 5 ml/kg
Acute Oral LD50 (rat): 18.75 ml/kg
Primary dermal irritation (rabbits): slightly irritating
Draize eye irritation (rabbits): non-irritating
Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY
Carcinogenicity: OSHA: NO IARC: YES - 2B NTP: NO ACGIH: YES (A3)

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

This product may contain methyl tertiary butyl ether (MTBE): animal and human health effects studies indicate that MTBE may cause eye, skin, and respiratory tract irritation, central nervous system depression and neurotoxicity. MTBE is classified as an animal carcinogen (A3) by the ACGIH.

12. ECOLOGICAL INFORMATION

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations. If released, oxygenates such as ethers and alcohols will be expected to exhibit fairly high mobility in soil, and therefore may leach into groundwater. The API (www.api.org) provides a number of useful references addressing petroleum and oxygenate contamination of groundwater.

13. DISPOSAL CONSIDERATIONS

Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME:	Gasoline
DOT HAZARD CLASS and PACKING GROUP:	3, PG II
DOT IDENTIFICATION NUMBER:	UN 1203
DOT SHIPPING LABEL:	FLAMMABLE LIQUID

PLACARD:

15. REGULATORY INFORMATION

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a “petroleum exclusion” clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

ACUTE HEALTH	CHRONIC HEALTH	FIRE	SUDDEN RELEASE OF PRESSURE	REACTIVE
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION WT. PERCENT
Benzene (71-43-2)	0.1 to 4.9 (0.1 to 1.3 for reformulated gasoline)
Ethyl benzene (100-41-4)	< 3

n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Toluene (108-88-3)	1 to 15
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 to 15

US EPA guidance documents (www.epa.gov/tri) for reporting Persistent Bioaccumulating Toxics (PBTs) indicate this product may contain the following deminimis levels of toxic chemicals subject to Section 313 reporting:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION - Parts per million (ppm) by weight
Polycyclic aromatic compounds (PACs)	17
Benzo (g,h,i) perylene (191-24-2)	2.55
Lead (7439-92-1)	0.079

CALIFORNIA PROPOSITION 65 LIST OF CHEMICALS

This product contains the following chemicals that are included on the Proposition 65 "List of Chemicals" required by the California Safe Drinking Water and Toxic Enforcement Act of 1986:

INGREDIENT NAME (CAS NUMBER)	Date Listed
Benzene	2/27/1987
Ethyl benzene	6/11/2004
Toluene	1/1/1991

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 2 (Flammable Liquid)
Class D, Division 2A (Very toxic by other means) and Class D, Division 2B (Toxic by other means)

16. OTHER INFORMATION

NFPA® HAZARD RATING	HEALTH:	1	Slight
	FIRE:	3	Serious
	REACTIVITY:	0	Minimal
HMIS® HAZARD RATING	HEALTH:	1 *	Slight
	FIRE:	3	Serious
	PHYSICAL:	0	Minimal
			* CHRONIC

SUPERSEDES MSDS DATED: 07/01/06

ABBREVIATIONS:

AP = Approximately	< = Less than	> = Greater than
N/A = Not Applicable	N/D = Not Determined	ppm = parts per million

ACRONYMS:

ACGIH	American Conference of Governmental Industrial Hygienists	CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
AIHA	American Industrial Hygiene Association	DOT	U.S. Department of Transportation [General Info: (800)467-4922]
ANSI	American National Standards Institute (212)642-4900	EPA	U.S. Environmental Protection Agency
API	American Petroleum Institute (202)682-8000	HMIS	Hazardous Materials Information System

IARC	International Agency For Research On Cancer	REL	Recommended Exposure Limit (NIOSH)
MSHA	Mine Safety and Health Administration	SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
NFPA	National Fire Protection Association (617)770-3000	SCBA	Self-Contained Breathing Apparatus
NIOSH	National Institute of Occupational Safety and Health	SPCC	Spill Prevention, Control, and Countermeasures
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)	STEL	Short-Term Exposure Limit (generally 15 minutes)
NTP	National Toxicology Program	TLV	Threshold Limit Value (ACGIH)
OPA	Oil Pollution Act of 1990	TSCA	Toxic Substances Control Act
OSHA	U.S. Occupational Safety & Health Administration	TWA	Time Weighted Average (8 hr.)
PEL	Permissible Exposure Limit (OSHA)	WEEL	Workplace Environmental Exposure Level (AIHA)
RCRA	Resource Conservation and Recovery Act	WHMIS	Workplace Hazardous Materials Information System (Canada)

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

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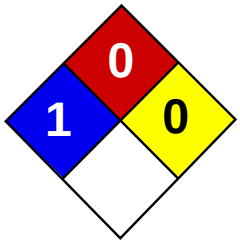

Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Lead MSDS

Section 1: Chemical Product and Company Identification

Product Name: Lead

Catalog Codes: SLL1291, SLL1669, SLL1081, SLL1459, SLL1834

CAS#: 7439-92-1

RTECS: OF7525000

TSCA: TSCA 8(b) inventory: Lead

CI#: Not available.

Synonym: Lead Metal, granular; Lead Metal, foil; Lead Metal, sheet; Lead Metal, shot

Chemical Name: Lead

Chemical Formula: Pb

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Lead	7439-92-1	100

Toxicological Data on Ingredients: Lead LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Non-flammable in presence of open flames and sparks, of shocks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: When heated to decomposition it emits highly toxic fumes of lead.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable

protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.05 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.05 (mg/m3) from OSHA (PEL) [United States] TWA: 0.03 (mg/m3) from NIOSH [United States] TWA: 0.05 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 207.21 g/mole

Color: Bluish-white. Silvery. Gray

pH (1% soln/water): Not applicable.

Boiling Point: 1740°C (3164°F)

Melting Point: 327.43°C (621.4°F)

Critical Temperature: Not available.

Specific Gravity: 11.3 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, excess heat

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Can react vigorously with oxidizing materials. Incompatible with sodium carbide, chlorine trifluoride, trioxane + hydrogen peroxide, ammonium nitrate, sodium azide, disodium acetylide, sodium acetylide, hot concentrated nitric acid, hot concentrated hydrochloric acid, hot concentrated sulfuric acid, zirconium.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. May cause damage to the following organs: blood, kidneys, central nervous system (CNS).

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential: Skin: Lead metal granules or dust: May cause skin irritation by mechanical action. Lead metal foil, shot or sheets: Not likely to cause skin irritation Eyes: Lead metal granules or dust: Can irritate eyes by mechanical action. Lead metal foil, shot or sheets: No hazard. Will not cause eye irritation. Inhalation: In an industrial setting, exposure to lead mainly occurs from inhalation of dust or fumes. Lead dust or fumes: Can irritate the upper respiratory tract (nose, throat) as well as the bronchi and lungsby mechanical action. Lead dust can be absorbed through the respiratory system. However, inhaled lead does not accumulate in the lungs. All of an inhaled dose is eventually abssorbed or transferred to the gastrointestinal tract. Inhalation effects of exposure to fumes or dust of inorganic lead may not develop quickly. Symptoms may include metallic taste, chest pain, decreased physical fitness, fatigue, sleep disturbance, headache, irritability, reduces memory, mood and personality changes, aching bones and muscles, constipation, abdominal pains, decreasing appetite. Inhalation of large amounts may lead to ataxia, deliriuim, convulsions/seizures, coma, and death. Lead metal foil, shot, or sheets: Not an inhalation hazard unless metal is heated. If metal is heated, fumes will be released. Inhalation of these fumes may cause "fume metal fever", which is characterized by flu-like symptoms. Symptoms may include metallic taste, fever, nausea, vomiting, chills, cough, weakness, chest pain, generalized muscle pain/aches, and increased white blood cell count. Ingestion: Lead metal granules or dust: The symptoms of lead poisoning include abdominal pain or cramps (lead cholic), spasms, nausea, vomiting, headache, muscle weakness, hallucinations, distorted perceptions, "lead line" on the gums, metallic taste, loss of appetite, insomnia, dizziness and other symptoms similar to that of inhalation. Acute poisoning may result in high lead levels in the blood and urine, shock, coma and death in extreme cases. Lead metal foil, shot or sheets: Not an ingestion hazard for usual industrial handling.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (female) which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Lead California prop. 65 (no significant risk level): Lead: 0.0005 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Lead Connecticut hazardous material survey.: Lead Illinois toxic substances disclosure to employee act: Lead Illinois chemical safety act: Lead New York release reporting list: Lead Rhode Island RTK hazardous substances: Lead Pennsylvania RTK: Lead

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R20/22- Harmful by inhalation and if swallowed. R33- Danger of cumulative effects. R61- May cause harm to the unborn child. R62- Possible risk of impaired fertility. S36/37- Wear suitable protective clothing and gloves. S44- If you feel unwell, seek medical advice (show the label when possible). S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:21 PM

Last Updated: 05/21/2013 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

APPENDIX B – CEI LABS, INC. DOCUMENTATION

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 101768-0

CEI Labs, Inc.

Cary, NC

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

BULK ASBESTOS FIBER ANALYSIS

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2015-04-01 through 2016-03-31

Effective dates

For the National Institute of Standards and Technology

NVLAP® **National Voluntary Laboratory Accreditation Program**

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

CEI Labs, Inc.
107 New Edition Court
Cary, NC 27511
Dr. Tianbao Bai
Phone: 919-481-1413 Fax: 919-481-1442
E-Mail: bai@ceilabs.com
URL: http://www.ceilabs.com

BULK ASBESTOS FIBER ANALYSIS (PLM) **NVLAP LAB CODE 101768-0**

NVLAP Code	*Designation / Description*
18/A01	EPA 600/M4-82-020: Interim Method for the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

2015-04-01 through 2016-03-31
Effective dates

For the National Institute of Standards and Technology

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 101768-0

CEI Labs, Inc.

Cary, NC

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

AIRBORNE ASBESTOS FIBER ANALYSIS

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2015-04-01 through 2016-03-31

Effective dates

For the National Institute of Standards and Technology

NVLAP® National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

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AIRBORNE ASBESTOS FIBER ANALYSIS (TEM) **NVLAP LAB CODE 101768-0**

NVLAP Code	*Designation / Description*
18/A02	U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

2015-04-01 through 2016-03-31

Effective dates

For the National Institute of Standards and Technology

CEI LABS, INC.
Quality Assurance Manual

CEI Labs, Inc.
107 New Edition Court
Cary, NC 27511

Tianbao Bai, Ph. D., CIH
Laboratory Director

Original Issue: September 2002
Last Revision: November 2014
Revised: January 2015,
Gary A. Swanson, Quality Manager

1.1 ACCREDITATION OVERVIEW

1.1.1 Fields of Testing.

1.1.1.1 CEI Labs, Inc. has selected AIHA IHLAP accreditation for Quantifying Asbestos and other Fiber types by Phase Contrast Microscopy.

1.1.1.2 CEI Labs, Inc. has selected AIHA EMLAP accreditation for Indoor Air Quality, Quantifying and Identifying Airborne Fungi Spores from Spore Traps.

1.1.1.3 CEI Labs, Inc. has selected NVLAP accreditation for Asbestos Air Analysis by AHERA rules using Transmission Electron Microscopy.

1.1.1.4 CEI Labs, Inc. has selected NVLAP accreditation for Asbestos Analysis of Bulk Building materials using Polarized Light Microscopy.

1.1.2. Quality Policy Statement.

1.1.2.1 It is the policy of CEI Labs, Inc. (CEI) to provide our customers with the best analytical results possible using the most appropriate industry methods and state-of-art equipment. We understand that all laboratory personnel affect data quality; therefore, complete understanding of the SOP and QA Manuals by all employees of CEI is imperative.

1.1.2.2 The purpose of CEI's management system is to ensure high quality of data for its customers, and to maintain and improve upon a quality assurance program that allows us to provide excellent results. All necessary quality control procedures are taken to achieve this goal. The CEI management system routinely undergoes review processes to maintain and improve the quality of CEI laboratory services, and to improve the effectiveness of the management system.

1.1.2.3 CEI will adhere to all pertinent NIST, NVLAP, AIHA, and ISO 17025-2005 policies and continue to improve the quality of analysis in the laboratory.

1.1.2.4 Methods used for PCM analysis are defined, established, and verified by National Institute for Occupational Safety and Health (NIOSH). Reporting limits are established by NIOSH methodology and implemented by strict adherence to the NIOSH 7400 Test Method.

1.1.2.5 Methods used for fungi spore trap analysis are defined, verified, and established by CEI.

1.1.2.6 Methods used for TEM AHERA analysis are defined, verified, and established by the Environmental Protection Agency (EPA).

1.1.2.7 Methods for PLM analysis of bulk building materials are defined, verified, and established by the EPA.

1.1.3 Review of Manual

1.1.3.1 I have reviewed the **CEI Labs, Inc. Quality Assurance Manual** and have found it to be appropriate for the scope of work performed at this laboratory facility.

1.1.3.2 I state that the laboratory complies with all applicable federal, state, and local regulations regarding safety and health.

1/29/15

Tianbao Bai, CIH, PhD, Laboratory Director, CEI Labs, Inc. Date

01/27/2015

Gary A. Swanson - Quality Manager, CEI Labs, Inc. Date

1.1.4 Employee Compliance Statement

1.1.4.1 Employees shall be required to sign a statement of compliance with the *CEI Labs, Inc. Quality Assurance Manual*, AIHA-LAP LLC Policies, *NIST Handbook 150*, and ISO 17025:2005 that states: "As an employee of CEI Labs, Inc., I have read the *CEI Labs, Inc. Quality Assurance Manual* and agree to comply with any and all statements contained within. I realize that deviation from the quality assurance procedures could result in a corrective action and reprimand, and further deviation could result in termination."

1.1.4.2 Statements of compliance are maintained in Appendix I of the CEI Quality Assurance Manual.

2A.4 MANAGEMENT SYSTEM REQUIREMENTS

2A.1 CEI Labs maintains a copy of ISO/IEC 17025:2005 Standard in its entirety within the confines of the laboratory.

2A.4.1 Management Requirements: Organization

2A.4.1.1 CEI Labs, Inc is the legal name of the laboratory where analyses are to be performed. CEI Labs, Inc. shall be held legally responsible for all laboratory work performed on its premises.

2A.4.1.2 CEI will perform testing according to requirements of the AIHA-LAP, LLC Policy Module and ISO/IEC 17025:2005, and also to satisfy the needs of the customer, and the regulatory authorities or organizations providing recognition.

2A.4.1.3 CEI's laboratory management system shall only cover work carried out in the laboratories facilities at 107 and 118 New Edition Court, Cary North Carolina, 27511. CEI does not perform laboratory services outside of this location.

2A.4.1.4 CEI does perform some sampling for which its own laboratories provide analyses.

2A.4.1.4.a CEI does not permit the field technician that generated the samples for the laboratory to perform the analyses of those samples.

2A.4.1.4.b CEI does not engage in contract analyses that create an incentive for biased results.

2A.4.1.4.c It is the goal of CEI to maintain an environment that encourages impartiality and operational integrity.

2A.4.1.5 Additional Requirements.

2A.4.1.5.a CEI maintains managerial and technical personnel who, irrespective of other responsibilities, have the authority and resources needed to carry out their duties, including the implementation, maintenance and improvement of the management system, and to identify the occurrence of departures from the management system or from the procedures for performing tests and/or calibrations and to initiate actions to prevent or minimize such departures. (Section 2A.5.2 will define these managers and technicians, their educational requirements, as well as their responsibilities).

2A.4.1.5.b At no point will the work load exceed 90% of the laboratories capacity. CEI produces an environment which analysts are free from commercial, financial, and other influences that might adversely affect the quality of their work.

2A.4.1.5.c CEI understands and has a duty to protect customer confidentiality and proprietary rights. All sample testing results shall be protected and kept confidential. No data will be released without prior written consent of the customer, including electronic data transmission via fax or email.

2A.4.1.5.c.(i) To protect customer confidentiality and proprietary rights, this notice is always on each fax cover page: “The contents contained in this fax are confidential and legally protected. If you received this fax by accident, please destroy immediately and call our office.

2A.4.1.5.c.(ii) Reports transmitted to the customer by email contain the following statement on the cover page: “The contents contained in this email are confidential and legally protected. If you received this email by accident, please delete it immediately and call our office”.

2A.4.1.5.d Analysts at CEI must explicitly follow only the approved procedures for the sample type and test they have been assigned for a given sample.

2A.4.1.5.d.(i) CEI employees do not engage in activity that will diminish confidence in its competence, impartiality, judgment, or operational integrity.

2A.4.1.5.d.(ii) CEI does not engage in contract analyses that create an incentive for biased results.

2A.4.1.5.e Organizational Structure

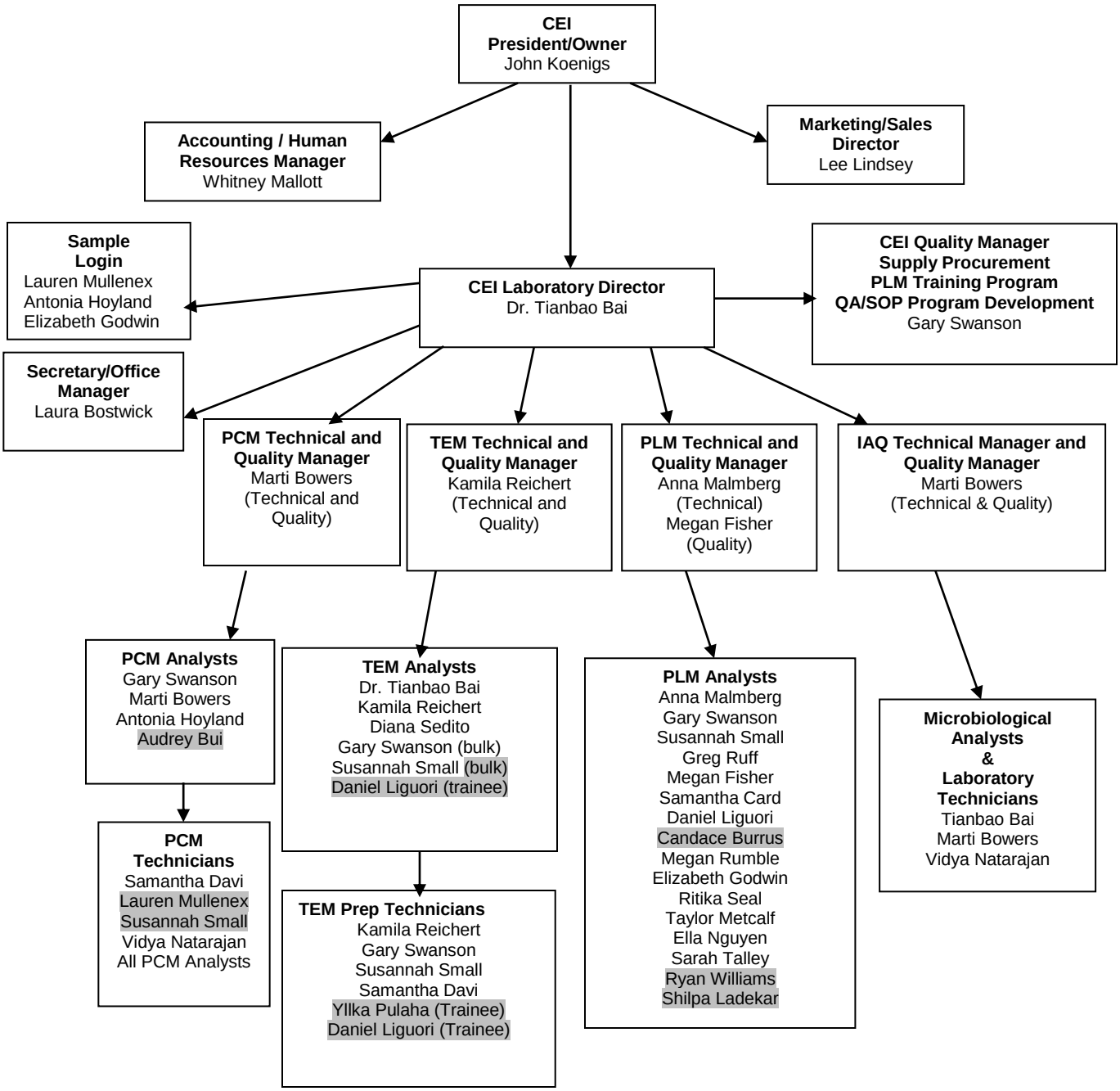
2A.4.1.5.e.(i). CEI is an industrial hygiene/indoor air quality analytical laboratory located at 107, 105, 109, 116, and 118 New Edition Court in Cary, North Carolina. The laboratory is accredited AIHA-LAP for analysis of fiber counts by NIOSH 7400 and mold spore trap counts by CEI developed methods. CEI is currently accredited by NVLAP (National Voluntary Laboratory Accreditation Program) for bulk asbestos analysis by PLM, and air samples by TEM AHERA protocols. Air, dust, bulk, swab, and direct tape lift samples are analyzed for the detection of mold contamination in indoor environments. CEI Maintains accreditation by the California Department of Health for asbestos analysis of bulk asbestos samples by PLM and also possesses certifications from other states to conduct asbestos analysis for bulk and air media. Other non-accredited asbestos testing (dust and bulk asbestos by TEM, etc.) are also performed by CEI at its facilities. The laboratory employs state-of-art equipment and methodologies in the analysis of customer samples.

2A.4.1.5.e.(ii) As part of CEI's quality management system, the quality assurance and quality control of the laboratory is directly overseen by the Laboratory Director. The Quality Manager is in charge of everyday QA/QC activity. Analysts at CEI perform the actual QA/QC activities. The TABLE 1 conveys a chart showing the structure of CEI Labs, Inc.

2A.4.1.5.f Specific Laboratory Personnel – Laboratory positions are presented in section 2A.4.1.5.f to 2A.4.1.5.m.(ix). Appendix I of the CEI Quality Assurance Manual documents approval for their descriptions and duties, as well as statements of employee compliance with the CEI Quality Assurance Manual.

2A.4.1.5.f.(i) **Laboratory Director**
The Laboratory Director is responsible for all laboratory operations and the Quality Assurance Program. This includes, but is not limited to: laboratory accreditation status, the training of personnel, calibration of equipment, sample handling and login procedures, contamination control and worker safety in the laboratory, maintenance of appropriate records, implementation of Inter-and Intra-laboratory QC programs, overall accuracy/precision of laboratory data, and supervision of all personnel. The laboratory director is responsible for assuring all employees are compliant with ISO/IEC 17025, the CEI QA Manual, CEI SOP manuals and the pertinent policies of the AIHA-LAP, and *NIST Handbook 150*.

TABLE 1. Organizational Structure of CEI Labs, Inc.



2A.4.1.5.g. **Technical Managers** – CEI provides adequate supervision of testing staff, including trainees. Technical managers are familiar with methods and procedures, purpose of each test and/or calibration, and with the assessment of the test results.

2A.4.1.5.g.(i) **Laboratory Manager (PCM Laboratory)**
Laboratory Manager is the title given for the laboratory's technical manager. The Laboratory manager is responsible for

implementation of CEI's Quality Assurance Program. This includes, but is not limited to: sample handling and login, worker safety and contamination control in the laboratory, and supervision of all laboratory personnel. The Laboratory Manager oversees production-related planning and workload for the laboratory.

2A.4.1.5.g.(ii) **Laboratory Manager (IAQ Laboratory)**
Laboratory Manager is the title given for the laboratory's technical manager. The Laboratory Manager is responsible for implementing CEI's Quality Assurance Program. This includes, but is not limited to: sample handling and login, worker safety and contamination control in the laboratory, and supervision of all laboratory personnel. The Laboratory Manager oversees production related planning and workload for the laboratory. In order to meet the education and experience requirements required for this position, the Indoor Air Quality Laboratory employs two individuals to serve as co-managers for this position.

2A.4.1.5.g.(iii) **Laboratory Manager (PLM Laboratory)**
Laboratory Manager is the title given for the laboratory's technical manager. The Laboratory manager is responsible for implementing CEI's Quality Assurance Program. This includes, but is not limited to: sample handling and login, worker safety and contamination control in the laboratory, and supervision of all laboratory personnel. The Laboratory Manager oversees production-related planning and workload for the laboratory.

2A.4.1.5.g.(iv) **Laboratory Manager (TEM Laboratory)**
Laboratory Manager is the title given for the laboratory's technical manager. The Laboratory manager is responsible for implementing CEI's Quality Assurance Program. This includes, but is not limited to: sample handling and login, worker safety and contamination control in the laboratory, and supervision of all laboratory personnel. The Laboratory Manager oversees production-related planning and workload for the laboratory.

2A.4.1.5.h Technical managers have responsibility for the technical operations and the provision of resources needed to insure the required quality of laboratory operations.

2A.4.1.5.i **Quality Managers** – CEI appoints staff members to act as quality managers who, irrespective of other responsibilities, shall have defined responsibility and authority for ensuring that the management system, related to quality, is implemented and followed at all times. The quality managers shall have direct access to the highest level of management at which decisions are made on laboratory policy or practice.

2A.4.1.5.j **Quality Manager (PCM Laboratory), (IAQ Laboratory), (PLM Laboratory), (TEM Laboratory)**
The Quality Manager is responsible for implementing the Quality Assurance Program on a daily basis. This includes, but is not limited to: calibration of equipment, sample handling and login, worker safety and contamination control in the laboratory, analysis of QC data, resolution of analytical discrepancies, evaluation of the monthly QC data, and maintenance of appropriate records.

2A.4.1.5.k CEI appoints deputies for key personnel, to carry out their duties in their absence or under their authority, should the need arise. Appendix I of the CEI Quality Assurance Manual contains a summary of these key personnel and their deputies.

2A.4.1.5.l. Top management ensures that CEI personnel are aware of the relevance and importance of their activities and how they contribute to the achievement of the objectives of the quality management system.

2A.4.1.5.l.(i) CEI conducts semi-annual performance reviews of all employees. The relevance and importance of the employees' performance activities to the laboratory and quality management system are emphasized and reviewed.

2A.4.1.5.l.(ii) Bi-weekly meetings are conducted with laboratory staff to disseminate information and emphasize short term projections and goals of CEI.

2A.4.1.5.m. **Non-management Positions and Personnel.**

2A.4.1.5.m.(i) **PCM Laboratory Analyst**
Laboratory Analysts perform analysis of PCM samples using the NIOSH 7400 method. They are responsible for the accuracy and precision of the work they perform. Laboratory Analysts routinely work under the supervision of the Laboratory Director and the Quality Manager in implementing QA/QC procedures on a daily basis. Responsibilities include, but are not limited to: daily calibration of equipment, sample handling and login, sample preparation and analysis, contamination control in the laboratory, implementing worker safety procedures, and report generation.

2A.4.1.5.m.(ii) **PCM Laboratory Technician**
Laboratory Technicians are responsible for sample login, sample preparation, daily cleaning of the sample preparation area, creating additional preparations in accordance with the Quality Assurance Program, entering data, and generating reports from that data.

2A.4.1.5.m.(iii) **Microbiological Analyst**
Microbiological Analysts are responsible for performing work submitted to the Indoor Air Quality Laboratory using methods approved by CEI. They are responsible for the accuracy and precision of the work they perform. Laboratory Analysts routinely work under the supervision of the Laboratory Director and the

Quality Manager in implementing QA/QC procedures on a daily basis. Responsibilities include, but are not limited to: daily calibration of equipment, sample handling and login, sample preparation and analysis, contamination control in the laboratory, implementation of worker safety procedures, and report generation.

2A.4.1.5.m.(iv) **IAQ Laboratory Technician**
Laboratory Technicians are responsible for sample login, sample preparation, media preparation, and daily cleaning of the sample preparation room.

2A.4.1.5.m.(v) **PLM Laboratory Analyst**
PLM analysts are responsible for performing work submitted to the PLM Laboratory using the approved EPA Methods. They are responsible for the accuracy and precision of the work they perform. Laboratory Analysts routinely work under the supervision of the Laboratory Director and the Quality Manager in implementing QA/QC procedures on a daily basis. Responsibilities include, but are not limited to: daily calibration of equipment, sample handling and login, sample preparation and analysis, contamination control in the laboratory, implementation of worker safety procedures, and report generation.

2A.4.1.5.m.(vi). **TEM Laboratory Analyst**
TEM analysts are responsible for performing work submitted to the TEM Laboratory using the approved EPA Methods. They are responsible for the accuracy and precision of the work they perform. Laboratory Analysts routinely work under the supervision of the Laboratory Director and the Quality Manager in implementing QA/QC procedures on a daily basis. Responsibilities include, but are not limited to: daily calibration of equipment, sample handling and login, sample preparation and analysis, contamination control in the laboratory, implementation of worker safety procedures, and report generation.

2A.4.1.5.m.(vii) **TEM Laboratory Prep Technician**
Laboratory Technicians are responsible for sample login, sample preparation according to approved methods, media preparation, and daily cleaning of the sample preparation room.

2A.4.1.5.m.(viii) **Laboratory Secretary/Office Manager**
The Laboratory Secretary is responsible for the preparation of final test reports forwarded to customers, maintenance of appropriate customer files, and customer relations.

2A.4.1.5.m.(ix) **Login Technician**
Login Technicians are responsible for sample receipt. They determine and record the condition and acceptability of samples submitted to CEI, and process and package the samples for delivery to the laboratory. Login technicians create internal chain of custody records and deliver them with the samples to the

laboratory, as well as assign unique sample identification numbers to all test items processed by the laboratory.

2A.4.1.6 Top management communicates with laboratory personnel through bi-weekly meetings, semi-annual performance reviews, and memoranda. A notice of communication concerning quality assurance and other relevant documents is kept by the quality manager to ensure all personnel are aware that those documents are available for inspection at any time. Employees may directly address their supervisory managers with concerns about any issue. Personnel are also able to address concerns they may have during the scheduled weekly management meeting.

2A.4.2 Management Requirements: Management System

2A.4.2.0 The quality management system established by CEI is designed to comply with the ISO/IEC 17025:2005 Standard, AIHA-LAP accreditation requirements and *NIST Handbook 150* requirements for the Fields of Testing for which we have applied or been accredited. The quality management system documentation is presided over by the Laboratory Director, and the Quality Manager. Quality Assurance activities are documented by all personnel, under the direction of the quality management system.

2A.4.2.0.a A policy statement has been issued under the authority of top management. It is located in section 1.1.2 of this manual (*CEI Quality Assurance Manual* (CEI QA Manual).

2A.4.2.0.b Yearly management reviews, including production summaries, quality control summaries, and other pertinent data are conducted in order to assess the effectiveness of the quality management system. Recommendations for improvement are included as part of this review. Monthly QC reports assess the effectiveness of the quality control procedures. The importance of meeting customer, as well as statutory and regulatory requirements is the primary goal of continued management review and improvements to the quality management system.

2A.4.2.0.c Primary analytical procedures are addressed in Standard Operations and Procedures for each laboratory. The QA Manual contains procedures for quality control / quality assurance for all of CEI's laboratories.

2A.4.2.0.d Quality Managers and Technical Managers have clearly defined duties so that a combination of quality and service can be optimized and delivered to CEI's customers.

2A.4.2.1 Documents contained within the QA Manual and any other referenced quality documents are consistent with the requirements of ISO/IEC 17025:2005, QA/QC requirements of the approved methods used, and other AIHA-LAP, LLC and NISTHandbook specific requirements detailed within section 2A Management System Requirements. The QA Manual addresses, but is not limited to the following elements:

2A.4.2.1.a Title Page
2A.4.2.1.b Table of Contents
2A.4.2.1.c Quality Manual Maintenance and Update Procedures

2A.4.2.1.d Customers' confidential information and proprietary rights
2A.4.2.1.e Impartiality and Operational Integrity
2A.4.2.1.f Organization and Responsibility
2A.4.2.1.g Quality Assurance Objectives and Policies
2A.4.2.1.h Document Control
2A.4.2.1.i. Review of Requests, Tenders and Contracts
2A.4.2.1.j Purchasing of Services and Supplies
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2A.4.2.1.z Data Reduction, Validation and Reporting
2A.4.2.1.aa Quality Assurance Reports
2A.4.2.1.bb Reference to other Management System Documentation

2A.4.2.2 The Quality Manual is be updated whenever necessary, but must be reviewed annually by the Quality Manager, and the Laboratory Director.

2A.4.3 Management Requirements: Document Control

2A.4.3.1 Procedures for the control of documents that form the quality management system (internally generated or from external sources), such as regulations, standards, other normative documents, test and/or calibration methods, as well as drawings, software, specifications, instructions and manuals must adhere to the procedures contained here with in.

2A.4.3.1a Document Approval and Issue – All documents issued by the laboratory as part of the management system are reviewed and approved by the Laboratory Director and the Quality Manager.

2A.4.3.1b A master list of documents is maintained by the Quality Manager. The latest revision status and current location of the document's use is recorded on this master list. When a document is approved that replaces an obsolete document, a copy of the document is kept as a master copy, and several duplicates are to be readily available to preclude use of invalid and/or obsolete documents.

2A.4.3.2.1 All documents created and approved by management must contain the following information: Date of issue, Issuing Authority, Issue and/or Revision #, Document Title, Page #, and the Total # of Pages. If it is not possible to demarcate the total number of pages, the phrase "END OF DOCUMENT" must be placed on the final page of the document to indicate its finality.

2A.4.3.2.2 General laboratory documents in large circulation may alternatively be coded with a document version presented in the following format:

AODT.MM.YY.P/N.IA

Where:
AODT = Abbreviation of the Document Title (not limited to 4 characters).
MM = Month of Document Revision/Approval.
YY = Year of Document Revision/Approval
P/N = Page Number of Total Number of Pages
IA = Issuing Authority; this will be "LD" for Laboratory Director, "QM" for the Quality Manager, "LM" for the Laboratory Manager

Adherence to this system allows each document to be uniquely identified from previous versions. All new documents and revisions must be submitted to the Laboratory Director and Quality Manager for review through use of the Document Approval Worksheet.

2A.4.3.2.2.a Authorized editions of appropriate documents are available at all locations where operations essential to the effective functioning of the laboratory are performed.

2A.4.3.2.2.b Documents are revised as needed, or examined annually during the quality management review in order to ensure continuing suitability and compliance with applicable requirements.

2A.4.3.2.2.c Invalid or obsolete documents are promptly removed from all points of issue or use, or otherwise assured against unintended use.

2A.4.3.2.2.d Obsolete documents, retained either for legal or knowledge preservation purposes, are suitably marked. Electronically stored management system documents that are obsolete are moved to an "obsolete documents" folder in the computer storage system and "obsolete" is included in the computerized document name.

2A.4.3.2.2.e For the PCM and IAQ laboratories: Any physical documents that are determined to be obsolete will be removed from all points of issue and immediately shredded.

2A.4.3.2.3 Adherence to this system allows each document to be uniquely identified from previous versions. All new documents and revisions must be submitted to the Laboratory Director and Quality Manager for review through use of the Document Approval Worksheet.

2A.4.3.3 Document Changes

2A.4.3.3.1 Changes to documents are reviewed and approved by the same function (section 2A.4.3.1 to 2A.4.3.2) that performed the original review unless specifically designated otherwise. The Laboratory Director and Quality

Manager have access to pertinent background information upon which to base their review and approval.

2A.4.3.3.2 Where practicable, the altered or new text shall be identified in the document or the appropriate attachments.

2A.4.3.3.2.a Altered or new is indicated by shading the text in a transparent gray color, still allowing for the text to be read. If the text has been altered by hand, a yellow or blue transparent highlighter felt tip pen can be used to indicate the altered text.

2A.4.3.3.2.b Indicators of altered text, including attachments, may be removed 1) after the text has been present for a period of one year, or 2) upon the next revision of the document.

2A.4.3.4 Control of Electronic Documents

2A.4.3.4.1 Electronic documents created and maintained by CEI Labs include but are not limited to: commercial website content, electronic copies of SOP's, Filemaker Pro versions, and Microsoft Excel templates for quality control.

2A.4.3.4.2 Electronic documents must contain as part of their contents, the following information: Date of issue, and/or date of revision, Issuing Authority, and Document Title.

2A.4.3.4.3 Electronic documents such as worksheets and operating procedures, that also are maintained in hard copy form, must be maintained using procedures outlined in 2A.4.3.1 to 2A.4.3.3.

2A.4.3.4.4 Security of Electronic Documents

2A.4.3.4.4.a Approved versions of documents, are placed into folders which have varying levels of access. Table 2 shows the level of access for different electronic document types.

2A.4.3.4.4.a.(i) Manager Access Only – These electronic documents are restricted to managers and their deputies. Records and supporting electronic scripts on these documents must not be changed without managerial approval.

2A.4.3.4.4.a.(ii) Read Only – Read only documents are documents which can not be changed, and must only be used if a hard copy is needed. These are documents that personnel should have access to for viewing or printing, but should only be altered through the document revision process.

2A.4.3.4.4.a.(iii) Full Access – These documents are intended to have their records be modifiable. Documents where frequent data entry is performed may be accessible to all personnel. Once data has been compiled, its status may be changed to one of the other electronic document categories.

2A.4.3.4.4.b CEI prefers documents that are created restricted modifiable content, except for the entry of records or data. If it is practicable to do so, CEI tries to use these types of electronic documents.

2A.4.3.5 Quality Assurance Manual - Maintenance and Updates

2A.4.3.5.1 The *CEI Quality Assurance Manual* is updated annually following the annual internal audit. This occurs in January and/or February of each year.

2A.4.3.5.2 The *CEI Quality Assurance Manual* may be updated at other intervals following additional internal audits, or external audits from CEI's accrediting agencies.

2A.4.3.5.3 *Quality Assurance Manual* updates require approval from the CEI Laboratory Director and the CEI Quality Manager.

2A.4.3.5.4 A statement of compliance to the manual's procedures must be obtained by all CEI employees that work under the domain of the *Quality Assurance Manual*.

2A.4.3.5.5 The CEI Quality Assurance Manual is maintained by the Quality Manager. The Quality Manager shall issue hard copies of the CEI Quality Assurance Manual to each of CEI's testing laboratories within 10 working days of any updates to the manual.

Table 2: Document Access

Category of Access:	Manager Access Only Documents	Read Only Documents	Full Access Documents
Examples of Files:	Quality Control Templates (e.g. calculation of Sr values), Documents that require long term protection, research and development files, reference material information. SOP manual master files, QA manual master file	Worksheets that are used in hard copy form, SOP electronic copies, QA manual electronic copies, recent QA/QC records.	QC Records for the current month, Filemaker Pro Data Base for creating new records, Data Entry Modules for test reports.

2A.4.4 Management Requirements: Review of Requests, Tenders, and Contracts

2A.4.4.1 Any contract, written or verbal, is reviewed by CEI management to ensure that the requested testing is within the laboratories capacity and resources, and that the laboratories personnel have the skills and expertise necessary for the requested testing.

2A.4.4.1.a The Customer Chain of Custody Worksheet acts as a written contract for request of testing to be performed at CEI. The Customer Chain of Custody Worksheet contains a list of possible tests, and the customer may choose the type of testing, defined by the method, to be performed.

2A.4.4.1.b After the type of testing is selected, a review is made by CEI management to determine if the laboratory has the capability and resources to meet the requirements.

2A.4.4.1.c A review of the Customer Chain of Custody Worksheet by CEI personnel is performed. If necessary information is missing from the Customer Chain of Custody Worksheet, the customer is contacted to retrieve the necessary information.

2A.4.4.1.c.(i) An attempt will be made to get the customer to respond, in writing if possible, to collect the necessary information to perform the work requested.

2A.4.4.1.c.(ii) CEI personnel document incomplete Customer Chain of Custody Worksheets by filling out the "Corrective Action Form". See Section 2A.5.8.2.c.(viii) for a detailed procedure for corrective action documentation of nonconforming Customer Chain of Custody Worksheets.

2A.4.4.1.c.(iii) Customers may submit samples for analysis on other worksheets, as long as the necessary information is provided by the customer to complete the requested testing.

2A.4.4.1.d Differences between the request or tender and the contract are resolved before any work commences. Each contract must be acceptable to both the laboratory and the customer.

2A.4.4.2 Records of reviews, including any significant changes in the contract must be maintained.

2A.4.4.2.a Records are also maintained of pertinent discussions with a customer relating to the customer's requirements or the result of the work during the period of execution of the contract.

2A.4.4.2.b CEI personnel document any significant contact with the customer over specific contracted work on the "Laboratory Chain of Custody Record" in the "Comments" section.

2A.4.4.3 The review of contracts extends to any work subcontracted by CEI to other laboratories.

2A.4.4.4 If a deviation from the contract becomes necessary, CEI personnel contacts the customer immediately. Work ceases until the deviation is approved by the customer and CEI management.

2A.4.4.5 If a contract needs to be amended after work has commenced, the same contract review process is repeated and any amendments are communicated to all affected personnel.

2A.4.4.6 Verbal contracts must be reviewed in the same manner as written contracts. Verbal contracts are usually completed by CEI Sales Representatives, and are recorded in the CEI Customer Data base until a written contract can be established between all affected parties.

2A.4.5 Management Requirements: Subcontracting of Tests and Calibrations

2A.4.5.1 When CEI subcontracts work, either because of unforeseen reasons or on a continuing basis, or because the work is not performed by CEI (i.e., non-approved test methods for the laboratory), this work shall be placed with a competent subcontractor. Whenever possible, the subcontractor shall comply with ISO/IEC 17025:2005. If the Field of Testing requested is covered by AIHA,-LAP, LLC, or NVLAP, and neither the customer nor other regulating agencies direct where the samples should be sent, CEI will send the subcontracted work to an accredited laboratory to which the field of testing CEI is also accredited(AIHA-LAP LLC or NVLAP).

2A.4.5.2 The laboratory advises the customer of the arrangement in writing, and when appropriate, gains the approval of the customer, preferably in writing.

2A.4.5.3 CEI is responsible to the customer for the subcontractor's work, except in the case where the customer or a regulatory authority specifies which subcontractor is to be used.

2A.4.5.4 CEI maintains a register of preferred subcontractors it uses for tests and/or calibrations, along with evidence of compliance with the International Standard for the work in question. A list of vendor/suppliers and subcontracted services is located in Appendix VI of the Quality Assurance Manual.

2A.4.5.4.a CEI does not subcontract test items when its own laboratory is accredited by AIHA-LAP, LLC, or NVLAP for the specific test.

2A.4.6 Management Requirements: Purchasing and Supplies

2A.4.6.1 CEI maintains a list of approved vendors. Materials procured for sample preparation and analysis are certified by the vendor that the purity and suitability of the material is appropriate for the testing method used. The following criteria are taken into consideration when approving a provider of services or materials:

2A.4.6.1a The vendor must provide Material Data Safety Sheets for standards and reagents purchased by CEI;

2A.4.6.1b a cost analysis is performed by the Laboratory Director to determine if the value / cost of the item or service is acceptable to CEI;

2A.4.6.1c when possible, the vendor providing the supplies, reagents, or standards must adhere to an International Standard.

2A.4.6.1.d products and/or services obtained by a vendor must be appropriate to CEI's needs and must not compromise the quality of CEI analytical services.

2A.4.6.2 The Quality Manage is designated to order and inspect supplies, reagents and standards for the laboratory.

2A.4.6.2.a The Quality Manager evaluates the suitability of a supply, reagent, or standard for the testing performed, and determines which vendor to procure the item(s).

2A.4.6.2.b The Quality Manager obtains permission from the Laboratory Director to purchase necessary item(s).

2A.4.6.2.c The Quality Manager places the order for the supply, reagent, or standard with the approved vendor, providing a purchase order number consisting of his/her initials, and the date the item(s) were purchased.

2A.4.6.2.d When possible, a packaging list and/or order confirmation shall be obtained from the approved vendor in order to inspect that the order was correctly placed.

2A.4.6.3 Purchasing documents for items affecting the quality of laboratory output must contain data describing the services and supplies ordered. The purchasing documents must be reviewed and approved for technical content prior to release.

2A.4.6.3.a CEI maintains a Laboratory Supplies Record Worksheet where critical information about supply purchases are recorded. The following information will be recorded when possible on the Laboratory Supplies Record Worksheet:

2A.4.6.3.a.(i) The date on which the supply, reagent or standard was ordered;
2A.4.6.3.a.(ii) the name of the supply, reagent or standard;
2A.4.6.3.a.(iii) the catalogue/item number of the supply, reagent or standard.
2A.4.6.3.a.(iv) the quantity of the supply, reagent or standard ordered;
2A.4.6.3.a.(v) the supplier/vendor name from which the supply, reagent or standard was ordered;
2A.4.6.3.a.(vi) initials of the staff member who received/checked/inspected the supply, reagent or standard ordered;
2A.4.6.3.a.(vii) the date the supply, reagent or standard was received;
2A.4.6.3.a.(viii) the lot/batch number of the supply, reagent or standard received;
2A.4.6.3.a.(ix) the condition in which the supply, reagent or standard was received.

2A.4.6.3.b CEI stores supplies, reagents, and standards according to manufacturers' specifications, and must provide adequate space for such items to be stored. Prior to storage or use, standard and solution preparations must be labeled with the following information:

2A.4.6.3.b.(i) Description of content;
2A.4.6.3.b.(ii) date of preparation;
2A.4.6.3.b.(iii) concentration/purity of the material;
2A.4.6.3.b.(iv) manufacture and lot number of parent material;
2A.4.6.3.b.(v) assigned expiration date;
2A.4.6.3.b.(vi) the initials of the technician that prepared the material.

2A.4.6.4 When possible, the vendor providing the supplies, reagents, or standards must adhere to an International Standard. If supplies, reagents, and/or standards obtained by CEI are found to adversely affect the quality of testing in the laboratory, the Laboratory Director and the Quality

Manager evaluate the vendor providing those materials or services, and determine if that vendor shall remain an approved supplier for CEI. This evaluation is documented.

2A.4.6.4.a An review of suppliers/vendors occurs annually. The Quality Manager and the Laboratory director go over the list of suppliers, evaluate if any have failed to meet criteria for approval as suppliers/vendors to CEI, then determine if any suppliers/vendors should be removed from the approved vendor list.

2A.4.6.4.b Any services rendered by those removed vendors should be sought out by the Quality Manager, and vendors for those supplies/services should be approved through the established approval process (2A.4.6.1. to 2A4.6.1d of this manual).

2A.4.6.4.c A list of vendor/suppliers and subcontracted services is located in Appendix VI of the Quality Assurance Manual.

2A.4.7 Management Requirements: Service to the Customer

2A.4.7.1 It is a goal at CEI that customers submitting samples for testing get the highest quality data. This means that CEI personnel are willing to cooperate with customers or their representatives in clarifying customers' requests and in monitoring the laboratory's performance in relation to the work performed. CEI ensures that its customers' information, and the testing performed, remains confidential. CEI performs its analyses, providing impartial, unbiased data.

2A.4.7.2 CEI seeks feedback, both positive and negative, from its customers. The feedback is used and analyzed to improve the management system, testing and calibration activities, and customer service.

2A.4.7.2.a CEI performs an annual survey of many of its customers to determine if the laboratory and personnel of CEI are providing outstanding service to its customers. The results of these surveys are reviewed and summarized in the annual Quality Management System Review.

2A.4.7.2.b CEI personnel address any customer complaint or question. All personnel are trained to re-issue original reports, and do basic computer system searches for customer information.

2A.4.7.2.c CEI personnel are trained to maintain customer confidentiality through the use of passwords to access electronic databases, as well as confirming the requestor's identity through the use of account numbers and other key information provided with customer chain of custody forms submitted with testing samples.

2A.4.8 Management Requirements: Customer Complaints

2A.4.8.1 Customer complaints are documented and addressed by the Laboratory Manager, the QC Manager, or the Laboratory Director. Customer complaints can fall under one of two categories:

2A.4.8.1.a Nonconforming work, or suspected nonconforming work;
Suspected nonconforming work is handled like all nonconforming work in the laboratory. Management personnel shall initiate an investigation of the suspected nonconforming work. If suspected nonconforming work is verified, a corrective action is taken, and the customer is assured that such work will be minimized in the future. CEI shall take necessary action to ensure this.

2A.4.8.1.b Complaints *not related* to the quality of CEI's analytical capabilities or quality;
Complaints of this nature are considered strictly personnel issues, and are addressed by CEI employees' adherence to the *CEI Company Policy Manual.*

2A.4.8.2 CEI's procedures for customer complaints are applied to all complaints made to CEI, including employee complaints, complaints from vendors, accrediting agencies and other parties.

2A.4.8.3 Procedure for Addressing Complaints:

2A.4.8.3.a Any complaint received by any party must be investigated.

2A.4.8.3.b A root cause analysis is conducted to verify the complaint.

2A.4.8.3.c Corrective action is issued, where necessary, and then monitored to determine if the corrective action was effective in resolving the complaint.

2A.4.8.3.d Complaints are documented on the "Corrective Action Report for Non-conforming Events" worksheet.

2A.4.8.4 CEI's goal is to resolve any complaints, from customers or other parties, in an ethical manner with impartiality, and to the satisfaction of the customer when possible.

2A.4.9 Management Requirements: Control of Nonconforming Testing

2A.4.9.1 If nonconforming testing or problems with the quality management system occur, including tests of inter-laboratory (Round Robin) or Proficiency Test samples, an investigation must be initiated by CEI.

2A.4.9.1.a An investigation is conducted by the Quality Manager, the Laboratory Manager, or the Laboratory Director.

2A.4.9.1.b If the nonconforming work is verified, and considered significant, the Laboratory Director then makes a decision of halting work and/or stop the issue of analytical reports.

2A.4.9.1.c An investigation team consisting of management and analysts investigates all aspects of the quality management system for potential deficiencies. Corrective actions are implemented

immediately, following appropriate steps specified in the QA Manual.

2A.4.9.1.d Where necessary, the customer is notified, and test results that do not conform are recalled.

2A.4.9.1.e If work has been halted, the Laboratory Director will determine at which time work shall resume.

2a.4.9.1.f. Investigations of nonconforming work are documented on the "Corrective Action Report for Non-conforming Events" worksheet.

2A.4.9.2 Where the evaluation indicates that the nonconforming work could recur, or that there is doubt about the compliance of the laboratories compliance with its own policies, the corrective action procedures in Section 2A.4.11 shall promptly be followed.

2A.4.9.2.a Any outlier from a Proficiency Test, Round Robin, or any other demonstration of competency is addressed as a non-conforming event.

2A.4.10 Management Requirements: Improvement

2A.4.10.1 The laboratory continually improves the effectiveness of its management system through the use of the quality policy, quality objectives, audit results, analysis of data, corrective and preventive actions, and management review.

2A.4.10.2 Audits of the laboratory may be conducted in addition to CEI's regularly scheduled times if the Laboratory Director sees the need for such an action necessary. The Laboratory Director may evaluate the quality management system through an audit or review process based on results from any investigation requiring corrective action.

2A.4.11 Management Requirements: Corrective Action

2A.4.11.1 CEI determines the corrective action of a particular nonconformity through use of root cause analysis. The Laboratory Director must approve all corrective actions that involve a change to the quality management system. Corrective actions that do not involve changes to the quality management system are documented by the Quality Manager and do not require approval by the Laboratory Director. All corrective actions and nonconforming events are documented in the Monthly QC Summary.

2.A.4.11.2 Prior to implementation of corrective action, an investigation must be made to determine the root cause(s) of the problem.

2A.4.11.2.a Cause analysis is performed in order to determine which actions resulted in nonconforming work and which actions did not result in nonconforming work.

2A.4.11.2.b All parties involved are consulted discuss a way to solve the problem.

2A.4.11.2.c Proficiency Tests or DOC rounds that lead to the "Not Proficient" status of a laboratory are addressed by the corrective action process.

2A.4.11.3 The investigative team selects the appropriate corrective action(s) to take, which may include, but are not limited to: reissue or amendment of an analytical report, retraining personnel, procurement of new equipment, or improving procedures to eliminate problems and prevent recurrence. The corrective action is to a degree appropriate to the magnitude and risk of the problem.

2A.4.11.4 The corrective action is implemented, and monitored to ensure it is an effective course of action.

2A.4.11.5 Where the identification of nonconformities or departures casts doubts on the laboratory's compliance with its own policies and procedures, or on its compliance with this ISO/IEC 17025:2005, and/or AIHA-LAP, the laboratory ensures the appropriate areas of activity are audited as soon as possible.

2A.4.12 Management Requirements: Preventive Action

2A.4.12.1 The laboratory provides an environment where needed improvements and potential sources of nonconformities, either technical or concerning the management system, are identified. When improvement opportunities are identified or if preventive action is required, action plans are developed, implemented and monitored to reduce the likelihood of the occurrence of such nonconformities and to take advantage of opportunities for improvement.

2A.4.12.2 CEI takes several opportunities throughout the course of its regularly scheduled activities to address preventive action. Nonconformities may be identified through the following regularly occurring activities:

2A.4.12.2.a Daily Quality Control analysis;
2A.4.12.2.b monthly QC Summaries;
2A.4.12.2.c Annual Audit and Quality Management System Review;
2A.4.12.2.d Annual Customer Service Survey;
2A.4.12.2.e Daily contamination checks;
2A.4.12.2.f regularly scheduled calibration of equipment;
2A.4.12.2.g participation in Proficiency Testing and Round Robin programs;
2A.4.12.2.h daily cleaning and checks of equipment

2A.4.13 Management Requirements: Control of Records

2A.4.13.1 **General** - CEI maintains hard copy records of internal documents and analytical reports in a system of file cabinets at 107, and 118 New Edition Court, Cary, NC. Quality Management System Documents are maintained by the Quality Managers in their offices or work areas. Specific employee records are maintained by the Human Resources office, under the control of the President of CEI.

2A.4.13.1.2 CEI stores its records at room temperature (20-25°C) in file cabinets clearly labeled as to the contents or files present within. Analytical reports and other records are also backed up electronically should an unforeseen event cause damage or deterioration to hard copy records.

2A.4.13.1.2.a All CEI electronic and hardcopy records are maintained for a minimum period of 3 years.

2A.4.13.1.2.b. In addition to electronic records stored at the CEI location, electronic records are backed up to a disc format, and stored off site.

2A.4.13.1.3 CEI records are held secure and in confidence. CEI personnel are trained to maintain customer confidentiality through the use of passwords to access electronic databases, as well as confirming the requestor's identity through the use of account numbers and other key information provided with customer chain of custody forms submitted with testing samples.

2A.4.13.1.4 Protection of electronic data

2A.4.13.1.4.a CEI maintains in-house a file server, and a back-up file server.

2A.4.13.1.4.b Analytical reports, and original data (electronic bench worksheets), are backed up hourly to the file server and back-up file server.

2A.4.13.1.4.c All laboratory documents are backed up on a daily basis both to the file server, and the back-up file server.

2A.4.13.1.4.d Daily, laboratory documents are backed up to, and stored by, an external electronic data storage service vendor.

2A.4.13.1.4.e Annually, records are moved to an archive which may only be accessed by certain computers and key laboratory personnel.

2A.4.13.1.4.f A backup of archived data is also saved to a data storage disc and removed to an off site location.

2A.4.13.2 **Technical Records** - Technical laboratory records, such has original observations, derived data and sufficient information to establish an audit trail, calibration records, staff records and a copy of each test report or calibration certificate issued, are maintained by CEI, either in hard copy or electronic format, for a minimum period of three years.

2A.4.13.2.1 Records for each test contain sufficient information to facilitate, if possible, identification of the factors affecting the uncertainty and to enable the test to be repeated under conditions as close as possible to the original. The records include the identity of personnel responsible for the sampling performance of each test and checking of results.

2A.4.13.2.1.a Records maintained by CEI for a minimum of three years shall include, but not be limited to, the following:

2A.4.13.2.1.a.(i) Customer Chain of Custody forms – to be completed by the customer;

2A.4.13.2.1.a.(ii) Laboratory Chain of Custody forms – to be completed by all who handle testing samples throughout the analytical process;

2A.4.13.2.1.a.(iii) Analytical Reports – to be completed by the analyst;

2A.4.13.2.1.a.(iv) Daily Analyst Record Books – to be completed by the analyst;
2A.4.13.2.1.a.(v) Monthly QC Reports – to be completed by the Quality Manager;
2A.4.13.2.1.b. CEI Maintains the following records for a minimum of 10 years, or as long as necessary:

2A.4.13.2.1.b.(i) Internal and External Audits – to be completed by the Laboratory Director and the QC Manager;

2A.4.13.2.1.b.(ii) Quality Management Review – To be completed by the Quality Manager;

2A.4.13.2.1.b.(iii) Proficiency Testing and Round Robin results – To be completed by the Quality Manager;

2A.4.13.2.1.b.(iv) Personnel Files – Maintained by the Laboratory Director containing the following information:

- 2A.4.13.2.1.b.(iv).(a) current Resume;
- 2A.4.13.2.1.b.(iv).(b) job description of each employee's job position;
- 2A.4.13.2.1.b.(iv).(c) appropriate training records;
- 2A.4.13.2.1.b.(iv).(d) summary of monthly QA/QC performances including resolution of discrepancies;
- 2A.4.13.2.1.b.(iv).(e) any other pertinent information regarding the analytical capability of that employee;

2A.4.13.2.1.b.(v) Equipment and Maintenance Records – Maintained by the Quality manager containing the following information:

- 2A.4.13.2.1.b.(v).(a) manufacturer;
- 2A.4.13.2.1.b.(v).(b) model number;
- 2A.4.13.2.1.b.(v).(c) serial number;
- 2A.4.13.2.1.b.(v).(d) calibration records;
- 2A.4.13.2.1.b.(v).(e) maintenance records;
- 2A.4.13.2.1.b.(v).(f) owner manuals;

2A.4.13.2.1.b.(vi) Customer Files – Maintained by the Laboratory Director containing the following information:

- 2A.4.13.2.1.b.(vi).(a) contracts;
- 2A.4.13.2.1.b.(vi).(b) key contacts and personnel;
- 2A.4.13.2.1.b.(vi).(c) billing and accounting information;
- 2A.4.13.2.1.b.(vi).(d) any pertinent information about the customer's preferences or needs that might be unique to that customer.

2A.4.13.2.2 Observations, data and calculations are recorded at the time they are made and shall be identifiable to the specific task.

2A.4.13.2.3 When mistakes occur in records, each mistake must be crossed out, not erased, made illegible or deleted, and the correct value entered alongside.

All such alterations to records must be signed or initialed by the person making the correction. In the case of records stored electronically, equivalent measures must be taken to avoid loss or change to original data.

2A.4.13.2.4 Correction to laboratory records must be dated.

2A.4.13.2.5 Records must be legible. Written records shall be created and maintained using indelible ink. No corrective fluids are used on original laboratory data records. Original records must be created using blue or black ink, unless the record requires a special color or highlight for the purpose of emphasis.

2A.4.13.2.6 Records may be disposed of after they have been held for their allotted period of time. The Master List of Documents contains an instruction for how those records are to be disposed of or destroyed.

2A.4.14 Management Requirements: Internal Audits

2A.4.14.1 Internal audits are conducted annually, and whenever the Laboratory Director wishes to evaluate the quality management system through an audit or review process based on results from any investigation requiring corrective action.

2A.4.14.1.a Audit objectives must be stated in the "Summary of Internal Audit".

2A.4.14.1.b Scheduled annual audits take place in January or February, and include assessments of data and analyses that occurred over the course of the previous year.

2A.4.14.1.c Additional audits may only examine part of the quality management system based on the particular need, as determined by the Laboratory Director, of a specific audit.

2A.4.14.1.d The Quality Manager plans and organizes the audits as required by the schedule and requested by management.

2A.4.14.1.e Audits must be carried out by trained and qualified personnel who are, wherever resources permit, independent of the activity to be audited.

2A.4.14.1.f The Quality Manager must be available to produce any records or documents investigated during the audit.

2A.4.14.1.g An audit response must be created to address any deficiencies or non-conforming events.

2A.4.14.1.h Corrective actions are included in the Audit Response.

2A.4.14.1.i The QA Manual and the SOP manuals are updated at this the time the audit is conducted.

2A.4.14.1.j All changes to the QA Manual and the SOP manuals must be documented in the Audit Response.

2A.4.14.2 Internal quality assurance audits must verify CEI's compliance with AIHA-LAP, LLC where accredited, NIST Handbook 150, 150-3, and 150-13 requirements where accredited by NVLAP, and with its own policies and procedures outlined in this manual and in applicable standard operating procedures manuals.

2A.4.14.2.a When audit findings cast doubt on the effectiveness of the operations or on the correctness or validity of the laboratory's test or calibration results, the laboratory takes timely corrective action, and notifies customers in writing if investigations show that the laboratory results may have been affected.

2A.4.14.2.b After corrective action(s) have been developed, a review shall take place within 30 days of issue to validate the effectiveness of the corrective action(s). The Quality Manager shall document the effectiveness of the corrective action(s).

2A.4.14.3 Audit results are shared, as appropriate, with laboratory personnel.

2A.4.15 Management Requirements: Management Reviews

2A.4.15.1 CEI performs management review annually in January or February. The review takes place after the annual audit, and the annual audit findings are cited in the Annual Quality Management Review Report. The Annual Quality Management Review Report is a review of the laboratory's management system and testing and calibration activities to ensure their continuing suitability and effectiveness, and to introduce necessary changes or improvements. The review includes, but not be limited to the following:

2A.4.15.1.a the suitability of policies and procedures;
2A.4.15.1.b reports from managerial and supervisory personnel;
2A.4.15.1.c the outcome of recent internal audits;
2A.4.15.1.d corrective and preventive actions;
2A.4.15.1.e assessments by external bodies;
2A.4.15.1.f the results of inter-laboratory comparisons and proficiency tests;
2A.4.15.1.g changes in volume and type of work;
2A.4.15.1.h customer feedback;
2A.4.15.1.i complaints;
2A.4.15.1.j recommendations for improvement;
2A.4.15.1.k other relevant factors, such as quality control activities, resources and staff training;
2A.4.15.1.l review of quality objectives and formulation of new quality objectives as needed.

2A.4.15.2 After completion of the Laboratory Management Review, top management (President/Owner, Laboratory Director, Laboratory Manager, and Quality Managers) shall convene to discuss if quality objectives have been met. They shall also investigate if current quality

objectives are sufficient, and if new quality objectives need to be achieved.

2A.4.15.3 Findings from management reviews and the actions that arise from them are recorded. The management ensures that those actions are carried out within an appropriate and agreed timescale. Results from management review are shared, as appropriate, with laboratory personnel.

2A.4.15.4 Each month, the Quality Manager provides reports to Laboratory Manager, and Laboratory Director regarding quality assurance matters. These reports include information on internal audits, proficiency program performance, nonconformities and corrective/preventive actions taken.

2A.5 TECHNICAL REQUIREMENTS

2A.5.1 Technical Requirements: General

2A.5.1.1 Many factors determine the correctness and reliability of the tests performed by CEI. These factors include:

2A.5.1.1.a human factors;
2A.5.1.1.b accommodation and environmental conditions;
2A.5.1.1.c test methods and method validation;
2A.5.1.1.d equipment;
2A.5.1.1.e measurement traceability;
2A.5.1.1.f sampling;
2A.5.1.1.g the handling of test items;

2A.5.1.2 The extent to which the factors contribute to the total uncertainty of measurement differs considerably between (types of) tests. CEI takes into account of these factors in developing test methods and procedures, in the training and qualification of personnel, and in the selection and calibration of the equipment it uses.

2A.5.2 Technical Requirements: Personnel

2A.5.2.1 CEI management ensures the competence of all who operate specific equipment, perform tests, evaluate results, and sign test reports. Personnel that are undergoing training are provided with appropriate supervision. Personnel performing specific tasks are qualified on the basis of appropriate education, training, experience and/or demonstrated skills, as required.

2A.5.2.1.1 Technical Manager – CEI shall provide day-to-day supervision of its technical operations by designating at least one Technical Manager per program. The Technical Manager must be an employee of the laboratory and present on site at least 20 hours per week or 50 percent of the laboratory's operating hours (whichever is less) to address technical issues for laboratory staff and customers. The Technical Manager documents that all analyses for which CEI are accredited are completed by personnel with appropriate education and/or technical background. The technical manager ensures that adequate supervision is provided for all laboratory technical personnel. The

Technical Manager or his/her deputy functions as the approved signatory. The Technical Manager must possess a bachelor's degree in an applicable physical or biological science.

2A.5.2.1.2 Quality Manager – The Quality Manager of the laboratory must possess a bachelor's degree in an applicable basic or applied science, and have at least one year of nonacademic analytical or quality control experience appropriate to the analyses performed by the laboratory. The Quality Manager must have documented training in statistics or laboratory quality assurance/quality policy.

2A.5.2.1.3 Analyst – Successful training in specific methodologies used in the laboratory are documented. Analysts must have demonstrated ability to produce reliable results through accurate analysis of certified reference materials, proficiency testing samples, or in-house quality control samples. Their performance is documented. Analysts are responsible for compliance with all quality assurance and quality control requirements pertaining to their technical functions.

2A.5.2.1.4 Combined Positions – The laboratory staff may consist of a Technical Manager, a Quality Manager, laboratory analyst(s), and technician(s) as needed. If a single individual serves more than one position, then this individual must meet all position qualifications and responsibilities. If this individual also performs analytical work, then his/her work must be reviewed by a second, qualified individual

2A.5.2.2 CEI management has created the following positions within the laboratory, each with different required duties and education levels. Positions, their descriptions, and education requirements are in Table 3.

2A.5.2.2.a CEI identifies the training needs and provides training of personnel. The training program is relevant to the present and anticipated tasks of the laboratory.

2A.5.2.2.a.(i) CEI management monitor production levels regularly to determine if the laboratory warrants the hire and/or training of laboratory personnel.

2A.5.2.2.a.(ii) CEI conducts semi-annual reviews of its employees. Training needs are identified through interview processes with employees during those review sessions.

2A.5.2.2.b.(iii) Discovery and identification of ongoing training needs can take place through internal and external audits, laboratory management reviews, and investigations (root cause analysis) of non-conforming work.

2A.5.2.2.c.(iv) When on-going training needs are identified, training commences for the identified need as soon as practicable.

2A.5.2.2.b CEI training processes are documented, and their effectiveness is monitored.

2A.5.2.2.c CEI has sufficient personnel to allow for all QA/QC to be performed. Qualified designees may fulfill the responsibilities of

the Quality Manager as needed and with proper documented training of personnel to fulfill that role.

2A.5.2.3 Job descriptions include required qualifications, experience, education, training and managerial duties.

TABLE 3. LABORATORY POSITIONS

Position Title	Description of Duties	Required Minimum Education Level
Laboratory Director	Responsible for the entire laboratory program. This includes, but is not limited to accreditation status, QA/QC program, report reviews, employee training, employee safety, calibrating equipment, record keeping, and the supervision of all personnel.	Doctorate in an applicable basic, or applied science.
Laboratory <Technical> Manager	Responsible for implementing the Quality Assurance Program. This includes, but is not limited to; sample handling and login, worker safety and contamination control, daily supervision of all laboratory personnel. Must be on-site a minimum of 20 hours per week or 50 percent of the CEI's operating hours.	Bachelor's degree in applicable, or applied science. Experience in applicable Fields of Testing.
Quality Manager	Responsible for implementing the Quality Assurance Program on a daily basis. This includes, but is not limited to calibration of equipment, sample handling and login, worker safety and contamination control in the laboratory, analysis of QC data, resolution of analytical discrepancies, evaluation of monthly QC data, and maintenance of appropriate records.	Bachelor's degree in applicable, or applied science. One year of non-academic analytical or quality control experience. Educational experience with statistics.
Laboratory Analyst (PCM, Microbiological, PLM, or TEM)	Responsible for the accuracy and precision of the work performed. Analysts routinely work under the supervision of the Quality Manager in implementing QA/QC procedures on a daily basis. Duties also include, but are not limited to daily calibration of equipment, sample handling and login, sample preparation and analysis, contamination control in the laboratory, implementation of worker safety procedures, report generation.	**PCM:** High School Diploma and completion of a NIOSH 582 equivalent training course. **Microbiological:** A bachelor's degree in microbiology or related field with at least one year of analytical experience. **PLM:** A bachelor's degree in applicable basic or applied science. In some cases laboratory experience may substitute this. A basic McCrone – equivalent Asbestos Identification Course in PLM Microscopy along with a CEI In-house Training Course. **TEM:** A bachelor's degree in applicable basic or applied science. In some cases laboratory experience may substitute this. A basic McCrone – equivalent Asbestos Identification Course in TEM Microscopy along with a CEI In-house Training Course.
Laboratory Technician	Responsible for sample login, sample preparation, daily inspection and cleaning of the sample preparation area, data entry and report generation.	Demonstrated ability to conduct the work assigned.

Secretary	Responsible for the preparation of final test reports forwarded to customers, maintenance of appropriate customer files, data entry, report generation, reception and customer relations.	Demonstrated ability to conduct the work assigned.

2A.5.2.4 Analysts must complete an external or internal training program for all applicable analyses or analytical techniques prior to performing unsupervised analyses on samples submitted by customers.

2A.5.2.5 CEI Management authorizes specific personnel to perform particular types of sampling and testing, to issue test reports, and to operate particular types of equipment.

2A.5.2.5.a CEI maintains records of the relevant authorizations(s), competence, educational and professional qualifications, training, skills and experience of all technical personnel, including contracted personnel. This information is readily available and shall include the date on which authorization and/or competence is confirmed.

2A.5.2.5.b Training is documented in laboratory records and include a description of the content and duration of the program.

2A.5.2.5.c All analysts and technicians are required to have a minimum of 20 business days of hands-on experience conducting analyses before initiation of independent work on customer test items.

2A.5.3 Technical Requirements: Accommodation and Environmental Conditions

2A.5.3.1 CEI maintains laboratory facilities for testing that have energy sources, lighting, and environmental conditions that facilitate correct performance of the tests.

2A.5.3.1.a The laboratory ensures that the environmental conditions do not invalidated the results or adversely affect the required quality of any measurement. The technical requirements for the accommodation and environmental conditions that can affect the test results are documented.

2A.5.3.2 The laboratory monitors, controls and records environmental conditions as required by the relevant specifications, methods and procedures or where they influence the quality of the results. Due attention is paid, for example to biological sterility, dust, humidity, electrical supply, and temperature, as appropriate to the technical activities concerned.

2A.5.3.2.a CEI must stop analysis of test items when environmental conditions jeopardize the results of the tests.

2A.5.3.3 CEI personnel ensure control of access to and use of areas affecting the quality of tests. The following conditions shall be met:

2.A.5.3.3.a There is effective separation between neighboring areas in which there are incompatible activities. Measures are taken to prevent cross contamination;

2A.5.3.3.b measures are taken to ensure good housekeeping in the laboratory. Special procedures must be prepared when necessary;

2A.5.3.3.c all chemicals, compressed gases, glassware and waste materials, etc. are appropriately stored and/or contained;

2A.5.3.3.d ventilation hood face velocities are appropriate and shall be measured and recorded semiannually;

2A.5.3.3.e lunch areas are separate from the testing areas. Consumption of food or beverages is not permitted in testing areas;

2A.5.3.3.f CEI is a non-smoking facility.

2A.5.3.3.g CEI personnel conduct monitoring of test areas for contamination of those areas by fibers or mold spores. If analysis of air samples taken from this monitoring show contamination by fibers or mold spores, the work in that area ceases until the work area is thoroughly cleaned. In such a case as a work area requires a cessation of work due to contamination, that area must be retested prior to approval for work to be resumed.

2A.5.4 Technical Requirements: Test Methods and Method Validation

2A.5.4.1 CEI ensures that all tests within its scope are performed using appropriate methods and procedures. These include sampling, handling, transport, storage and preparation of items to be tested, and where appropriate, an estimation of the measurement uncertainty as well as statistical techniques for analysis of test data.

2A.5.4.1.a The laboratory has instructions on the use and operation of all relevant equipment, and on the handling and preparation of items for testing, or both, where the absence of such instructions could jeopardize the results of tests.

2A.5.4.1.b All instructions, standards, manuals, and reference data relevant to the work of the laboratory are kept up to date and shall be made readily available to personnel.

2A.5.4.1.c Deviation from test methods occurs only if the deviation has been documented, technically justified, authorized, and accepted by the customer.

2A.5.4.2 CEI uses test methods, including methods for sampling, which meet the needs of the customer and which are appropriate for the tests it undertakes. Methods published in international, regional or national standards are preferably used.

2A.5.4.2.a The laboratory ensures that it uses the latest valid edition of a standard unless it is not appropriate to do so.

2A.5.4.2.b When necessary, the standard is supplemented with additional details to ensure consistent application.

2A.5.4.2.c When the customer does not specify the method to be used, the laboratory selects appropriate methods that have been published either in international, regional or national standards, or by reputable technical organizations, or in relevant scientific texts or journals, or as specified by the manufacturer of the equipment.

2A.5.4.2.d Laboratory-developed methods or methods adopted by the laboratory may also be used if they are appropriate for the intended use and if they are validated.

2A.5.4.2.e The laboratory informs the customer when the method proposed by the customer is considered to be inappropriate or out of date.

2A.5.4.3 When CEI develops a test method internally, the introduction of test methods developed by the laboratory for its own use are a planned activity and assigned to qualified personnel equipped with adequate resources. Plans are updated as a development proceeds and effective communication amongst all personnel involved is assured.

2A.5.4.4 When it is necessary to use methods not covered by standard methods, these are subject to agreement with the customer and must include a clear specification of the customer's requirements and the purpose of the test. The method developed must be validated appropriately before use. Method performance criteria (estimates of bias and precision) and acceptance limits must be stated.

2A.5.4.5 Validation of Methods – Validation is the confirmation by examination and the provision of objective evidence that the particular requirements for a specific intended use are fulfilled. CEI validates non-standard methods, laboratory designed/developed methods, standard methods used outside of their intended scope, and amplifications and modifications of standard methods to confirm that the methods are fit for the intended use. The validation is as extensive as is necessary to meet the needs of a given application of field of application.

2A.5.4.5.a Standard methods, procedures, and modifications of standard methods and procedures are acceptable only if the laboratory has verified acceptable method performance applicable to the field of testing. Standard methods and procedures are recommended by the Environmental Protection Agency, the National Institute for Occupational Safety and Health, ASTM International, AOAC International, the American Public Health Association, the Occupational Safety and Health Administration, or other national or international agencies.

2A.5.4.5.b Laboratory-developed methods and non-standard methods are used only if:

2A.5.4.5.b.(i) 1) the laboratory had developed and documented procedures covering topics a-k contained in the note in ISO/IEC 17025:2005, Section 5.4.4, including, but not limited to:

2A.5.4.5.b.(i).(a) appropriate identification;
2A.5.4.5.b.(i).(b) scope;
2A.5.4.5.b.(i).(c) description of type of item to be tested;
2A.5.4.5.b.(i).(d) parameters or quantities and ranges to be determined;
2A.5.4.5.b.(i).(e) apparatus and equipment, including technical performance requirements;
2A.5.4.5.b.(i).(f) reference standards and reference materials required;
2A.5.4.5.b.(i).(g) environmental conditions required and any stabilization period needed;
2A.5.4.5.b.(i).(h) description of the procedure, including:

- affixing of identification marks, handling, transporting, storing and preparation of items,
- Checks to be made before the work is started,
- Checks that the equipment is working properly and, where required calibration and adjustment of the equipment before each use,
- the method of recording the observations and results,
- safety measures to be observed;

2A.5.4.5.b.(i).(i) criteria and/or requirements for approval/rejection;
2A.5.4.5.b.(i).(j) data to be recorded and method of analysis and presentation;
2A.5.4.5.b.(i).(k) the uncertainty or the procedure for estimating uncertainty; and

2A.5.4.5.b.(ii) 2) the laboratory has validated the method covering the following topics as appropriate: minimum acceptance criteria, analyte specificity, linearity, range, accuracy, precision, detection limit, quantification limit, stability of reagents, inter-laboratory precision, and analysis robustness.

2A.5.4.5.c The laboratory defines the process utilized in the adoption and revision of analytical procedures employed by the laboratory, including when and how these procedures are reviewed and/or revised.

2A.5.4.5.d The range and accuracy of values obtainable from validated methods (eg. The uncertainty of results, detection limit, selectivity of the method, linearity, limit of repeatability and/or reproducibility, robustness against external influences, and/or cross sensitivity against interference from the matrix of the sample/test object), as assessed for the intended use, are relevant to the customer's needs.

2A.5.4.6 Estimation of Uncertainty of Measurement – CEI is a laboratory that, from time to time, must perform its own calibrations. CEI maintains and applies a procedure to estimate the uncertainty of measurement for all calibrations and types of calibrations.

2A.5.4.6.1 In certain cases the nature of the test method may preclude rigorous, metrologically and statistically valid, calculation of uncertainty of measurement. In these cases CEI attempts to identify all components of uncertainty and make a reasonable estimation, ensures that form of reporting of the result does not give a wrong impression of uncertainty. Reasonable estimation must be based on knowledge of the performance of the method and on the measurement scope and makes use of, for example previous experience and validation data.

2A.5.4.6.2 When estimating the uncertainty of measurement, all uncertainty components which are of importance in the given situation must be taken into account using appropriate methods of analysis.

2A.5.4.6.3 When reporting measurement uncertainty, the test report includes the coverage factor and confidence levels used in estimations (typically k=approximately 2 at the 95% confidence level).

2A.5.4.6.4 When the test method has a known and uncorrected systematic bias, it is reported separately from the test result and uncertainty estimation, as a probable bias value.

Appendix II of the QA manual states specific methods for determination of measurement of uncertainty.

2A.5.4.7 Control of Data - CEI establishes and maintains a data review process beginning at sample receipt and extending through the report process. The data review process is an independent review conducted by a qualified individual other than the analyst.

2A.5.4.7.1 The data reduction and review process includes, but is not limited to: comparison of quality control data against established acceptance limits, computation verification, transcription of data and adherence to the procedures established in the laboratory management system documents. If more than one parameter in a sample is tested, then the correlation of results are reviewed.

2A.5.4.7.1.a The analyst is responsible to ensure that quality control analysis is performed on his/her work prior to release of results, and that the work performed is in compliance with current quality control practices.

2A.5.4.7.1.b Procedures are established for each test type to ensure quality control procedures are complete before reporting of results to the customer.

2A.5.4.7.1.c Qualified individuals perform data review on test results after the quality control practices have verified the test results adhere to established acceptance limits.

2A.5.4.7.1.d Individuals authorized to perform data review are qualified through ongoing training and demonstration of knowledge about the specific test type.

2A.5.4.7.2 Calculations and data transfers are subject to appropriate checks in a systematic manner.

2A.5.4.7.2.a Prior to release of test results, quality control charts, or any published record where mathematical calculations are part of the presentation, any formulas and results derived from those formulas must be routinely checked.

2A.5.4.7.2.b During data review, CEI personnel are trained to verify and document two test results weekly to see if formulas used to calculate test results are functioning properly. Unverified spot check calculations take place daily.

2A.5.4.7.2.c Workbook templates (e.g. Microsoft Excel documents) are checked monthly to determine that the formulas used for calculations in data tables and charts are functioning correctly. Results of these checks are recorded in the Monthly QC Report.

2A.5.4.7.2.d When a test report format, template, worksheet, or any other document, that has a programmed formula, is placed under restricted access or locked by management, and has repeatedly had its functionality validated, the document may be validated less frequently as determined by the Quality Manager.

2A.5.4.7.3 When computers are used for the acquisition, processing, recording, reporting, storage or retrieval of test data, the laboratory shall ensure that:

2A.5.4.7.3.a computer software developed by the user is documented in sufficient detail and is suitably validated as being adequate for use;

2A.5.4.7.3.b procedures are established and implemented for protecting the data; such procedures include, but are not be limited to, integrity and confidentiality of data entry or collection, data storage, data transmission and data processing;

2A.5.4.7.3.c computers are maintained to ensure proper functioning and are provided with the environmental and operating conditions necessary to maintain the integrity of test data.

2A.5.5 Technical Requirements: Equipment

2A.5.5.1 An equipment log is maintained for each major item of equipment. Records are maintained in the equipment log that document preventive maintenance and repair, including those performed by laboratory personnel. The name or initials of the person performing the maintenance or repair is recorded.

2A.5.5.1.a Each individual laboratory (e.g. IAQ Laboratory, PCM Laboratory, etc.) possesses an equipment log specific to that laboratory. The quality manager or his/her designee shall ensures preventive maintenance is performed on crucial equipment to the laboratory.

2A.5.5.1.b Each laboratory at CEI is furnished with all items of sampling, measurement and test equipment required for the correct performance of the tests (including sampling, preparation of test). In those cases where the laboratory needs to use equipment outside of its permanent control,

CEI ensures that the requirements of the QA Manual are met, thereby meeting the International Standard for which AIHA-LAP, LLC accredits.

2A.5.5.2 Equipment critical to the generation of the test results is subject to performance checks prior to use for analysis of samples. Such checks include evaluation of instrument sensitivity, alignment, linearity, versus historical values.

2A.5.5.2.a Equipment and its software used for testing, calibration and sampling must be capable of achieving the accuracy required and must comply with the specification relevant to the tests performed.

2A.5.5.2.b Calibration programs are established for key quantities or values of the instruments where these properties have a significant effect on results. Calibration procedures must be included in the Standard Operations and Procedures manual for each test method.

2A.5.5.2.c Before being placed into service, equipment (including that used for sampling) is calibrated or checked to establish that it meets the laboratory's specification requirements and complies with the relevant standard specifications.

2A.5.5.2.d Acceptance criteria for equipment checks are stated in the analytical method.

2A.5.5.2.e Up-to-date instruction on the use and maintenance of equipment (including any relevant manuals provided by the manufacturer of the equipment) are stored in proximity to the equipment log, and remain available for use by the appropriate laboratory personnel.

2A.5.5.2.f Each item of equipment and its software used for testing and significant to the result is, when practicable, be uniquely identified.

2A.5.5.2.g Records are maintained of each item of equipment and its software significant to the tests performed. The records shall include the following:

2A.5.5.2.g.(i) the identity of the item of equipment and its software;
2A.5.5.2.g.(ii) the manufacturer's name, type identification, and serial number or other unique identification;
2A.5.5.2.g.(iii) checks that the equipment complies with the specification;
2A.5.5.2.g.(iv) the current location of the equipment;
2A.5.5.2.g.(v) the manufacturer's instructions, if available, or reference to their location;
2A.5.5.2.g.(vi) dates, results and copies of reports and certificates of all calibrations, adjustments, acceptance criteria, and the due date of next calibration;
2A.5.5.2.g.(vii) the maintenance plan, where appropriate, and maintenance carried out to date.
2A.5.5.2.g.(viii) any damage, malfunction, modification or repair to the equipment.

2A.5.5.3 Control of Equipment – Equipment may be handled, jostled, moved, or used in a way that may lead it to be taken out of service. Handling and storage of equipment, in such a way as to alter its proper function, are crucial to correct performance of testing.

2A.5.5.3.1.a CEI personnel only handle equipment according to manufacturer's specification, or within the parameters of the intended use of the equipment.

2A.5.5.3.1.b Equipment is cleaned regularly or when necessary to ensure that it is functioning properly and in order to prevent contamination or deterioration.

2A.5.5.3.1.c Equipment that has been subjected to overloading or mishandling, gives specific results, or has been shown to be defective or outside of specified limits, is taken out of service. It is isolated to prevent its use or clearly labeled or marked as being out of service until it has been repaired and shown by calibration or test to perform correctly.

2A.5.5.3.1.d The laboratory examines the effect of the defect or departure from specified limits on previous test and/or calibrations and institutes the "Control of Non-conforming work" procedure (Section 2A.4.9.1 of this manual).

2A.5.5.3.1.e Whenever practicable, all equipment under control of the laboratory and requiring calibration is labeled, coded or otherwise identified to indicate the status of calibration, including the date when last calibrated and the date or expiration criteria when calibration is due.

2A.5.5.3.2 When, for whatever reason, equipment goes outside of the direct control of the laboratory, the laboratory ensures that the function and calibration status of the equipment are checked and shown to be satisfactory before the equipment is returned to service.

2A.5.5.3.3 Results of the function and calibration status checks required for equipment that goes outside of the direct control of the laboratory is documented.

2A.5.5.3.3.a Designated personnel document this in the equipment log

2A.5.5.3.3.b The following is documented:

2A.5.5.3.3.b.(i) condition of equipment prior to release outside of the laboratory;
2A.5.5.3.3.b.(ii) condition of equipment upon return to the laboratory;
2A.5.5.3.3.b.(iii) reason for use of equipment outside the laboratory;
2A.5.5.3.3.b.(iv) person or organization responsible for equipment while it was out of laboratory control;
2A.5.5.3.3.b.(v) calibration, checks, repairs, or other equipment maintenance performed prior to the equipment being submitted back into service in the laboratory.

2A.5.5.3.4 Calibration procedures and intermediate checks are carried out according to defined procedures for each article of equipment, so that confidence in the calibration status of the equipment may be maintained.

2A.5.5.4 Calibration procedures specify frequency of calibration checks.

2A.5.5.4.1 Where calibration procedures give rise to a set of correction factors, the laboratory has procedures to ensure all documents (hard copies or electronic copies) are correctly updated.

2A.5.5.5 When possible, any external calibration service must be a calibration laboratory accredited to ISO/IEC 17025:2005 by a recognized accreditation body.

2A.5.5.6 Where appropriate, cleaning procedures for glassware and apparatus are specified by the laboratory and shall be appropriate for the method specified.

2A.5.6 Technical Requirements: Measurement Traceability

2A.5.6.1 All equipment used for tests, including equipment for subsidiary measurements (e.g., for environmental conditions) having a significant effect on the accuracy or validity of the result of the test or sampling is calibrated before being put into service. The laboratory shall have an established program and procedure for the calibration of its equipment.

2A.5.6.2. Requirements for Calibration Laboratories used by CEI

2A.5.6.2.1.a The program for calibration of equipment is designed and operated so as to ensure that calibrations and measurements made by the laboratory are traceable to the International System of Units (SI).

2A.5.6.2.1.b Calibration laboratories establish traceability of its own management standards and measuring instruments to the SI by means of an unbroken chain of calibrations or comparisons linking them to relevant primary standards of the SI units of measurement. To link the SI units is achieved by reference to national measurement standards. National measurement standards may be primary standards, which are primary realizations of the SI units or agreed representations of SI units base on fundamental physical constants, or they may be secondary standards which are standards calibrated by another national metrology institute.

2A.5.6.2.1.c When using external calibration services, treaceability of measurement is assured by the use of calibration services from laboratories that can demonstrate competence, measurement capability and traceability.

2A.5.6.2.1.d The calibration certificates issued by these laboratories must contain the measurement results, including the measurement uncertainty and/or a statement of compliance with and identified metrological specification.

2A.5.6.2.1.e There are certain calibrations that currently cannot be strictly made in SI units. In these cases calibration shall provide confidence in measurements by establishing traceability to appropriate measurement standards as:

2A.5.6.2.1.e.(i) the use of certified reference materials provided by a competent supplier to give a reliable physical or chemical characterization of a material;

2A.5.6.2.1.e.(ii) the use of specified methods and/or consensus standards that are clearly described and agreed by all parties concerned.

2A.5.6.2.1.f Participation in a suitable program of inter-laboratory comparisons is required where possible.

2A.5.6.2.2 Testing Laboratory Requirements

2A.5.6.2.2.a The requirements given in 2A.5.6.2.1 apply for measuring and test equipment with measuring functions used, unless it has been established that the associated contribution from the calibration contributes little to the total uncertainty of the test result.

2A.5.6.2.2.b Where traceability of the measurements to SI units is not possible and/or not relevant, the same requirements for traceability to, for example, certified reference materials, agreed methods and/or consensus standards, are required as for calibration laboratories.

2A.5.6.3 Reference Standards

2A.5.6.3.1 Reference *standards* in the laboratory must be traceable to SI units whenever possible. Calibration of reference standards are conducted by a body that can provide traceability as described in section 2A.5.6.2.1.

2A.5.6.3.1.a Reference standards of measurement held by the laboratory shall be used for calibration only and for no other purpose, unless it can be shown that their performance as reference standards would not be invalidated.

2A.5.6.3.1.a.(i) The laboratory shall demonstrate when possible, that calibrations of critical equipment and hence the measurement results generated by that equipment relevant to their scope of accreditation are traceable to the SI through and unbroken chain of calibrations.

2A.5.6.3.1.a.(ii) External calibration services shall wherever possible be obtained from providers accredited to ISO/IEC 17025 by an ILAC recognized laboratory. Calibration certificates must be endorsed by a recognized accreditation body symbol. Certificates must indicate treaceabilty to the SI or reference standard and include the measurement result with associated uncertainty of measurement.

2A.5.6.3.1.a.(iii) Where treaceability to the SI is not technically possible or reasonable, the laboratory uses certified reference materials provided by a competent supplier or use unspecified methods and/or consensus standards that are clearly described and agreed to by all parties concerned.

2A.5.6.3.2 Reference *materials*, where possible, must be traceable to SI units of measurement, or to certified reference materials. Internal reference materials are checked as far as is technically and economically practicable.

2A.5.6.3.2.a Reference materials must have a certificate of analysis that documents traceability to a primary standard or certified reference material and associated uncertainty, when possible. When applicable, the certificate must document the specific NIST SRM® or NMI certified reference material used for traceability.

2A.5.6.3.2.b Calibrations performed in-house are documented in a manner that demonstrates traceability via an unbroken chain of calibrations regarding the reference standard/material used, allowing for an overall uncertainty to be estimated for the in-house calibration.

2A.5.6.3.3 Intermediate checks are be performed on reference, primary, transfer or working standards and reference materials in order to maintain confidence in their calibration status. Checks are conducted according to regular schedules and procedures.

2A.5.6.3.3.a Calibrations are repeated at appropriate intervals, the length of which can be dependant on the uncertainty required, the frequency of use, the manner of use, stability of the equipment, and risk of failure considerations.

2A.5.6.3.3.b The Standard Operating Procedures (SOP) for each test type specify which reference standards and/or reference materials are suitable to that method. Procedures for calibration of reference standards and/or reference materials are defined in the specific SOP.

2A.5.6.3.3.c Each test method used by the laboratory defines the schedule of checks and calibrations for reference standards and/or reference material, and their frequency of such checks and calibrations.

2A.5.6.3.4 CEI personnel only handle reference standards according to manufacturer's specification, or within the parameters of the intended use of the reference standard.

2A.5.6.3.4.a Reference material and reference standards are stored according to manufacturers or calibration laboratory's specifications.

2A.5.6.3.4.b CEI makes an effort to provide storage space under the conditions the specific reference materials or reference standards require, including light, temperature and humidity, and other conditions required to minimize deterioration and protect the integrity of the reference materials or reference standards.

2A.5.6.4 Requirements for reagents and standards are specified by the laboratory to ensure the quality of testing.

2A.5.6.4.1 Reagents and standards are inspected, dated, and initialed upon receipt.

2A.5.6.4.2 Reagents are not used beyond assigned expiration dates. Materials designated for reevaluation, which are determined to have adequate purity upon reevaluation, are assigned a new expiration date.

2A.5.6.4.3 Strict control of reagent solutions and calibration standards are maintained.

2A.5.6.5 Documentation of standard and solutions preparations shall include a description of the content, the date of preparation, concentration and/or purity of the parent material, manufacturer and lot number of parent material, assigned expiration date, and the preparer's initials. Solutions shall be adequately identified to trace back to preparation documentation.

2A.5.7 Technical Requirements: Sampling

2A.5.7.1 The laboratory has a sampling plan and procedures for sampling when it carries out sampling of substances, materials or product for subsequent testing.

2A.5.7.1.a Sampling procedures are standardized and included or referenced in the SOP for the individual test method.

2A.5.7.1.b Equipment used for sampling follow the same control procedures as for laboratory equipment described in Section 2A5.5.3

2A.5.7.1.b.(i) The sampling process addresses the factors to be controlled to ensure the validity of the test results.

2A.5.7.1.c. The sampling plan as well as the sampling procedure is available at the location where sampling is undertaken. Sampling plans are, whenever reasonable, based on appropriate statistical methods.

2A.5.7.2 Where the customer requires deviations, additions or exclusions from the documented sampling procedure, these are recorded in detail with the appropriate sampling data and are included in all documents containing test results, and are communicated to the appropriate personnel.

2A.5.7.3 The laboratory maintains procedures for recording relevant data and operations relating to sampling that form part of the testing that is undertaken. These records include the sampling procedure used, the identification of the sampler, environmental conditions (if relevant) and diagrams or other equivalent means to identify the sampling location as necessary and, if appropriate, the statistics upon which the sampling procedures are based.

2A.5.7.4 Information regarding sampling materials, sampling containers, preservatives, and shipping instructions are available to the customers through the laboratory.

2A.5.7.5 Where appropriate, the laboratory requests that customers submit field blanks with their samples.

2A.5.8 Technical Requirements: Handling of Test Items

2A.5.8.1 The laboratory maintains procedures for the transportation, receipt, handling, protection, storage, retention and/or disposal of test items, including all provisions necessary to protect the integrity of the test item, and to protect the interest of the laboratory and the customer.

2A.5.8.2 Sample receipt. CEI receives samples either by courier (eg. FedEx, UPS, U.S. Mail), or by hand delivery.

2A.5.8.2.a Shipping containers are inspected for damage before acknowledging receipt. If any samples are damaged beyond the ability to test, the sample condition shall be documented and the customer shall be notified immediately.

2A.5.8.2.b Shipping containers are opened under an acrylic, HEPA-filtered negative air flow hood and test items are individually inspected. Submitted test items should be tightly sealed to prevent contamination, and should clearly be labeled with unique field identification numbers. Samples are inspected for their suitability for submission to the testing laboratory by Sample Receiving Technicians. Criteria for rejection of samples are addressed in the SOP Manuals for each test type.

2A.5.8.2.c CEI requests that its customers submit a "Customer Chain of Custody Form" with all test items. The Customer Chain of Custody Form must include the following information:

2A.5.8.2.c.(i) -the customer's name;
2A.5.8.2.c.(ii) -a project name or project identification number;
2A.5.8.2.c.(iii) -the type of test(s) the customer intends to have performed;
2A.5.8.2.c.(iv) -purchase order numbers when necessary;
2A.5.8.2.c.(v) -the expected turn-around-time for the work performed;
2A.5.8.2.c.(vi) -a contact, address, or designee from the customer to whom the work should be delivered;
2A.5.8.2.c.(vii) -any testing parameters needed to deliver results for the test (sampling volumes, sampling areas, conditions of testing area, sampling durations, etc.)
2A.5.8.2.c.(viii) -a "Corrective Action Report for Non-conforming Events" must be filled out if all necessary information is not provided. The corrective action should be obtaining permission from the customer for work to commence by supplying the necessary information to CEI. This is achieved by identifying the information needed, reporting any conversations with customers, recording the conditions under which work can commence, and recording what information was obtained for work to commence from contact with the customer.

2A.5.8.2.d After the initial inspection of the test items, and the test items are deemed adequate for the requested test; the samples are processed by login technicians. Login technicians assign the following information to the test items and record the information in the "Sample Log Book":

2A.5.8.2.d.(i) a unique batch number (the CEI Lab Code) for work intended to be reported on the same analytical report;

2A.5.8.2.d.(ii) a unique sample identification number for each sample in the batch, different from any previously used identification number;
2A.5.8.2.d.(iii) the number of test items submitted for a given batch;
2A.5.8.2.d.(iv) the initials of the Login Technician that received the samples.

2A.5.8.2.e The Customer Chain of Custody form is signed as received by CEI personnel, and the date and time the test items were received is documented on the Customer Chain of Custody form.

2A.5.8.2.f CEI Login Technicians create a "Laboratory Chain of Custody Form" from data obtained from the Customer Chain of Custody Form. The laboratory Chain of Custody Form documents custody of the test items as they travel to various locations of the laboratory. The Laboratory Chain of Custody Form contains, but is not limited to, the following information as it moves through the laboratory with the test items.

2A.5.8.2.f.(i) the customer's name;
2A.5.8.2.f.(ii) the CEI Lab Code;
2A.5.8.2.f.(iii) the CEI employee that received the samples;
2A.5.8.2.f.(iv) the test type(s) requested by the customer;
2A.5.8.2.f.(v) the time and date the samples were received by CEI
2A.5.8.2.f.(vi) the time and date the test results are due to the customer;
2A.5.8.2.f.(vii) the customer's project name and/or identification number;
2A.5.8.2.f.(viii) the name of the sampler and/or a contact who can be reached in case of questions regarding work submitted;
2A.5.8.2.f.(viii).ins the time and date test items were prepared;
2A.5.8.2.f.(ix) the time and date test items were analyzed;
2A.5.8.2.f.(x) the time and date test items test reports were generated;
2A.5.8.2.f.(xi) the date and time the analytical report was reviewed by an approved signatory;
2A.5.8.2.f.(xii) the date and time the analytical report was prepared for submission to the customer (scanning of documents, etc);
2A.5.8.2.f.(xiii) the date and time the project was reported to the customer (i.e. all analysis completed, and submitted to the customer);
2A.5.8.2.f.(xiv) notes regarding sample processing, analysis, or accounting based on a customer's particular needs;
2A.5.8.2.f.(xv) comments the analyst may have regarding the test items.

2A.5.8.3 Test items are then submitted to the appropriate laboratory for analysis.

2A.5.8.4 Laboratory technicians and laboratory analysts shall prepare and analyze test items appropriate to the test type requested. Laboratory technicians and analyst handle test items according to the SOP for the particular test type. Laboratory personnel generate analytical reports for the test items upon completion of requested work. This is documented on the Laboratory Chain of Custody Form.

2A.5.8.5 Test items are retained by the laboratory for a minimum period of thirty days, then disposed of according to federal, state and local regulations regarding environmental contamination and waste disposal.

2A.5.8.6 Stable samples may be retained for use in the laboratory's internal quality control program.

2A.5.8.7 The analytical report shall be delivered to the Laboratory Secretary. The Laboratory Secretary shall electronically scan Customer Chain of

Custody forms, then prepare the analytical report for delivery to the customer via fax, e-mail, or courier.

2A.5.9 Technical Requirements: Assuring the Quality of Test Results

2A.5.9.1 For each analytical test type the laboratory performs, the laboratory has quality control procedures for monitoring the validity of tests and calibrations undertaken. The resulting data is recorded in such a way that trends are detectable and, where practicable, statistical techniques are applied to the reviewing of the results. This monitoring is planned and reviewed and may include, but not be limited to, the following:

2A.5.9.1.a regular use of certified reference materials and/or internal quality control using secondary reference materials;

2A.5.9.1.b participation in inter-laboratory comparison or proficiency-testing programs;

2A.5.9.1.c replicate tests using the same or different methods;

2A.5.9.1.d retesting of retained items;

2A.5.9.1.e correlation of results for different characteristics of an item.

2A.5.9.1.1 Quality control data is analyzed and, where they are found to be outside pre-defined criteria, planned actions are taken to correct the problem and to prevent incorrect results from being reported. Deviations from standard quality control procedures are documented.

2A.5.9.1.1.a Deviations that result in nonconforming work are immediately evaluated.

2A.5.9.1.1.b At a minimum the following QC checks are performed per batch of samples:

2A.5.9.1.1.b.(i) Accuracy – Accuracy studies are performed to determine how close measurement comes to an actual or theoretical value. Regular use of certified reference materials is required.

2A.5.9.1.1.b.(ii) Precision – Precision is evaluated by the reproducibility of analyses. Precision is commonly expressed a standard deviation or relative percent difference can be evaluated by the analysis duplicate samples.

2A.5.9.1.1.c.(iii) Blanks – Blank sampling media and analytical reagents shall be analyzed, when applicable, with each batch of samples using the same procedure that is used for field samples. Customers of the laboratory should supply specimens of blank sampling media from the same source lot as was used for collecting the field samples.

2A.5.9.1.1.b.(iv) Acceptance Limits – Acceptance limits are established based on the statistical evaluation of the data generated by the analysis of quality control check samples, unless specific acceptance limits are established by the method. The calculation procedures for statistically derived acceptance limits shall be documented.

2A.5.9.1.1.b.(v) Control Charts – Control charts or quality control databases shall be used to record quality control data and compare them with acceptance limits. Procedures are in place to monitor trends and the validity of test results.

2A.5.9.1.2 Quality Control data is summarized on a monthly basis by the Quality Manager of each laboratory.

2A.5.9.1.3 Detection of Quality Control Data Trends

2A.5.9.1.3.a When using control charts that measure upper and lower control limits, as well as upper and lower warning limits, repetition of data points may indicate a trend.

2A.5.9.1.3.b Three consecutive data points by a single analyst near or outside of upper warning limits are recognized as trending data and are investigated through root cause analysis.

2A.5.9.1.3.c Three consecutive data points by more than one analyst near or outside of upper warning limits are recognized as trending data and are investigated through root cause analysis.

2A.5.9.1.3.d Three consecutive data points by a single analyst near or outside of lower warning limits are recognized as trending data and are investigated through root cause analysis.

2A.5.9.1.3.e Three consecutive data points by more than one analyst near or outside of lower warning limits are recognized as trending data and are investigated through root cause analysis.

2A.5.9.1.3.f If a cause for a trend is identified, procedures for corrective action are carried out by appropriate CEI personnel as outlined in Section 2A.4.11 of this manual.

2A.5.9.1.3.g Proficiency Testing and Inter-Laboratory (Round Robin proficiency testing) data are also examined for trends. Results that repeatedly fall near or outside of warning limits are investigated through root cause analysis, as outlined in section 2A.5.9.1.3.a.-f. of this manual.

2A.5.9.1.3.h When a cause for a trend is identified, procedures for corrective action are carried out by appropriate CEI personnel.

2A.5.9.1.3.i Individual data points falling outside of control limits do not constitute trending data, however they must be investigated as nonconforming work using procedures outlined in Section 2A.4.11 of this manual.

2A.5.10 Technical Requirements: Reporting the Results

2A.5.10.1 The results of each test or series of tests carried out by the laboratory is reported accurately, clearly, unambiguously objectively, and in accordance with any specific instructions in the test method.

2A.5.10.1.a The results are reported, usually in a test report, and include all the necessary information requested by the customer and necessary for the interpretation of the test results and all information required by the method used.

2A.5.10.1.b In the case of tests performed for internal customers, or in the case of written agreement with the customer, the results may be reported in a simplified way. Information not reported in the simplified format must be retained by the laboratory and are readily available should a need arise.

2A.5.10.2 Test Reports – Each test report includes at least the following information:

2A.5.10.2.a a title appropriate to the testing performed;

2A.5.10.2.b the name and address of the laboratory;

2A.5.10.2.c unique identification (CEI Lab Code) of the test report and on each page an identification in order to ensure that the page is recognized as part of the test report, and a clear identification of the end of the test report or calibration certificate.

2A.5.10.2.d page numbers on each page, and either *"x of y"* page numbering or a clear indication of the end of the report;

2A.5.10.2.e the name and address of the customer;

2A.5.10.2.f identification of the method used;

2A.5.10.2.g a description of, the condition of, and unambiguous identification of the item(s) tested;

2A.5.10.2.h the date of sample receipt;

2A.5.10.2.i the test results with, where appropriate, the units of measurement;

2A.5.10.2.j the name(s), function(s) and signatures(s) or equivalent identification of Person(s) authorizing the test report;

2A.5.10.2.k a statement to the effect that results relate only to the items tested.

2A.5.10.3 Test Reports – Test Reports also include the following information, where necessary for the interpretation of the test results:

2A.5.10.3.a deviations from, additions to, or exclusions from the test method, and information on specific test conditions, such as environmental conditions;

2A.5.10.3.b where relevant, a statement of compliance/non-compliance with requirements and/or specifications;

2A.5.10.3.c where applicable, a statement on the estimated uncertainty of measurement; information on uncertainty is needed in test

reports when it is relevant to the validity or application of the test results, when a customer's instructions so requires, or when the uncertainty affects compliance to a specification limit;

2A.5.10.3.d where appropriate and needed, opinions and interpretations;

2A.5.10.3.e additional information required by specific methods, customer, or groups of customers.

2A.5.10.4 Test reports that contain the results of sampling include the following, where necessary for the interpretation of results:

2A.5.10.4.a the date of sampling;

2A.5.10.4.b unambiguous identification of the substance, material or product sampled (including the name of the manufacturer, the model or type of designation and serial numbers as appropriate).

2A.5.10.4.c the location of sampling, including any diagrams, sketches or photographs;

2A.5.10.4.d a reference to the sampling plan and procedures used;

2A.5.10.4.e details of any environmental conditions during sampling that may affect the interpretation of the test results;

2A.5.10.4.f any standard or other specification for the sampling method or procedure, and deviations, additions to or exclusions from the specification concerned.

2A.5.10.5 Opinions and Interpretations – When opinions and interpretations are included, the laboratory documents the basis upon which the opinions and interpretations have been made. Opinions and interpretations are clearly be marked as such in a test report. Opinions and interpretations are not appropriate to AIHA LAP accredited fields of testing. No opinions or interpretations are issued on test reports for fields of testing covered by AIHA LAP.

2A.5.10.6 Testing and Calibration Results Obtained from Subcontractors – When the test report contains results of tests performed by subcontractors, these results must clearly be identified. The subcontractor must report the results in writing or electronically.

2A.5.10.7 Electronic Transmission of Results – In the case of transmission of test results by telephone, telex, facsimile or other electronic or electromagnetic means, the requirements of Section 2A.5.4.7 of the QA Manual must be met.

2A.5.10.8 Format of Reports – The format is designed to accommodate each type of test carried out to minimize the possibility of misunderstanding or misuse.

2A5.10.9 Amendments to Test Reports – Material amendments to a test report after issue shall be made only in the form of a further document, or data transfer, which makes clear that the amended document is a supplement to a previously issued document, and referencing the original document

identification code (CEI Lab Code). Amended test reports are issued in accordance with Section 2A.5.10.9.1 & 2A.5.10.9.2 of the QA Manual.

2A.5.10.9.1 Amended Report Procedure

2A.5.10.9.1.a If a laboratory record must be amended for whatever reason, the document is stamped “Amended”.

2A.5.10.9.1.b Documents amended by hand, until such time as a re-issue of the document becomes possible, are be marked clearly, initialed and dated. A revised document is formally re-issued as soon as practicable.

2A.5.10.9.2 Procedure for Amending Analytical Reports

2A.5.10.9.2.a Personnel creating changes to analytical reports must complete an “Amended Report Worksheet”, which identifies the nature and cause of the amendment. An explanation of the amendment must also be placed in the “Comments” section of the Laboratory Chain of Custody record.

2A.5.10.9.2.b A copy of the Amended Report Worksheet must be stored with the hard copy record of the original and amended reports. A copy of the Amended Report Worksheet must also be maintained by the Quality Manager.

2A.5.10.9.2.c The original analytical report is stamped “Obsolete”, clearly showing the document is no longer valid.

2A.5.10.9.2.d Electronic Storage of the amended analytical report requires that it be titled differently. For example, a report bearing the identifier of P13-1234, will now be stored as P13-1234A. If there are future amendments to the same analytical report, the amended reports are saved as P13-1234A.1, P3-1234A.2, etc.

2A5.10.10 Final test reports must include:

2A5.10.10.a reporting limit;

2A5.10.10.b any modification to test method, if applicable.

2A.5.10.11 The approved signatory is the Technical Manager or his/her designee.

2A.5.10.12 References to accreditation status on test reports

2A.5.10.12.a If CEI chooses to include a reference to its AIHA-LAP, LLC, accreditation (symbol/logo or accreditation number) on its test report, any test results not covered under AIHA-LAP, LLC accreditation is clearly identified on the report. If the laboratory chooses not to include a reference to AIHA-LAP, LLC accreditation on its test reports and performs both AIHA-LAP, LLC accredited testing with other non-recognized testing, these final test results must clearly show which results are recognized under AIHA-LAP, LLC accreditation, and which are not.

2A.5.10.12.b If CEI chooses to include a reference to its NVLAP accreditation (symbol/logo or accreditation number) on its test report, any test results not covered under NVLAP accreditation is clearly identified on the report. If the laboratory chooses not to include a reference to NVLAP accreditation on its test reports and performs both NVLAP accredited testing with other non-recognized testing, these final test results must clearly show which results are recognized under NVLAP accreditation, and which are not.

2A.5.10.13 Measurements below the method reporting limit are reported as "<" (less than) or "not detected" (ND) and reference the reportable limit. The reporting of zero concentration is not permitted.

2A.5.10.14 The final report states the measured quantitative result of the analysis of any blank samples submitted to the laboratory. Also, a statement must be made that discloses whether or not the sample results have been corrected for contamination based on the field blank or any other analytical blank.

2A.6 SAFETY AND HEALTH

2A.6.1 CEI follows applicable federal, state and local regulations regarding safety and health. As part of the application for accreditation or re-accreditation, on behalf of the organization seeking accreditation, the managers shall state that the laboratory complies with all applicable standards.

3.0 ACCREDITATION, MAINTENANCE AND RE-ACCREDITATION PROCESS

3.1 Proficiency Testing

3.1.1 Consistent with the scope of accreditation, CEI analyzes all proficiency test samples as defined in AIHA LAP, LLC Policy Module 6, by AIHA PAT Programs, LLC, or an equivalent proficiency testing program approved by AIHA-LAP, LLC.

3.1.2 Proficiency testing samples are analyzed on-site in a manner similar to customer samples.

3.1.3 Proficiency tests that require one set of results from the laboratory are performed in the following manner:

3.1.3.1 Samples are received and processed by CEI in accordance with all procedures outlined in the SOP and QA Manuals issued by CEI.

3.1.3.2 All analysts are required to read the proficiency test samples for the field(s) of testing for which they are authorized and report their results independently.

3.1.3.3 Upon first submission of results to the provider of the proficiency test, a single set of results is chosen at random from among participating analysts.

3.1.3.4 Afterward, analyst names are placed in a table in alphabetical order, starting with the first randomly chosen analyst, and results are chosen by assignment there after.

3.1.3.5 The table shall be maintained by the quality manager.

3.1.4 Results or analysis of proficiency samples are not discussed with other laboratories until the results have been publicly made available.

3.1.5 Round Robin Testing

3.1.5.1 For each of its accredited testing disciplines, CEI participates in a Round Robin (Inter-laboratory) proficiency program that is separate from the proficiency testing hosted by the accredited testing organizations.

3.1.5.2 Round Robins rounds shall take place greater than or equal to twice per year, no more than six months apart. A minimum of three laboratories must participate in each round.

3.1.5.3 Each round shall contain a minimum of four samples of varying concentrations of the analyte.

3.1.5.4 All analysts participate in each round of testing and generate results for each sample in the round separately. All analysts' results shall be used for data reduction and statistical analysis.

3.1.5.5 The units of the results are appropriate for the type of testing performed. Results are in units appropriate to the end use of the data, such as for comparison to target standards.

3.1.5.6 Acceptance criteria, data reduction and statistical analysis are appropriate for the testing discipline.

3.1.5.7 Identification and quantitation shall be taken into consideration for acceptance criteria.

3.1.5.8 If an analyst falls outside of acceptance criteria, the result(s) are considered to be a nonconforming event. Procedures found in *Section 2A.4.9 Control of Nonconforming Work* of this manual are implemented when nonconforming events occur.

3.2 Maintenance of Accreditation

3.1.1 For AIHA-LAP accredited field(s) of testing, CEI reports any changes in laboratory ownership, location, management, quality control personnel, or any other change that significantly affects the laboratory's capability, scope of accreditation, or ability to meet the policy requirements, in writing to the AIHA-LAP, LLC within twenty (20) business days of the change. Any absence of personnel for a period in excess of twenty (20) consecutive working days, that

impacts the laboratory's ability to perform its scope of testing, also is reported to AIHA-LAP, LLC within twenty (20) business days.

3.2.2 For NVLAP accredited field(s) of testing, CEI Labs must report to NVLAP within 30 days any major changes that affect the laboratory's Authorized Representative. This includes not only a change of the individual holding the position, but also the Authorized Representative's contact information, including address, phone number, and e-mail address.

3.2.3. Use of the AIHA-LAP logo

3.2.3.1 The AIHA-LAP, LLC accreditation logo may only be used by CEI Labs, Inc. subject to the limits described in 7.6 of the of the AIHA-LAP, LLC Policy Module. CEI shall only use the AIHA-LAP, LLC accreditation logo after signing the appropriate advertising/logo licensing agreement, detailing permissible usage. The AIHA-LAP, LLC accreditation advertising /logo signing agreement is provided at the time the accreditation certificate is issued. The laboratory signs and returns the advertising/logo licensing agreement to AIHA-LAP, LLC before AIHA-LAP, LLC will release the copy ready artwork of the logo to the CEI. All uses of the AIHA-LAP, LLC accreditation logo must be accompanied by the laboratory identification number (Laboratory ID: 103025). Which must appear directly beneath the accreditation logo.

3.2.4 Use of the NVLAP logo

3.2.4.1 The term NVLAP and the NVLAP logo shall not be used in a manner that brings NVLAP into disrepute or misrepresents CEI Labs' scope of accreditation or accredited status.

3.2.4.2 When the term NVLAP is used to reference CEI Labs' status, it shall be accompanied by the NVLAP Lab Code for Carolina Environmental Inc.

3.2.4.3 When the NVLAP logo is used to reference CEI Labs Inc.'s laboratory status, it shall be accompanied by the NVLAP Lab Code in an approved caption. The caption shall appear below and in close proximity to the logo. The following are the approved captions for CEI Labs, Inc.:

3.2.4.3.a "For the scope of accreditation under NVLAP Lab Code 101768-0"

3.2.4.3.b "NVLAP Lab Code 101768-0"

3.2.4.4 The form of the NVLAP logo shall stand by itself and shall not be combined with any other logo, symbol, or graphic.

3.2.4.5 The aspect ratio (height to width) of the form of the NVLAP logo shall be 1 : 2.25.

3.2.4.6. The NVLAP logo and the caption shall be of a size that allows the caption to be easily read. The size of the caption shall not exceed the size of the NVLAP logo.

3.2.4.7. The Logo shall appear in blue or black, or other color approved by NVLAP, and may be filled or unfilled. If the logo is filled, the same color shall be used for the outline and the fill.

3.2.4.8 The name of at least one Approved Signatory shall appear on a test report that displays the NVLAP logo or references NVLAP accreditation. The name shall be accompanied by the signature of the signatory.

3.2.4.9 The logo may only be used on test reports in which some, or all, of the data conforms to the scope of accreditation.

3.2.4.1.10 Test data that do not lie within the scope of accreditation, but are listed on a report that contains the NVLAP logo or reference of accreditation must be clearly identified as not being covered by the scope of accreditation. A report that contains data not covered by the scope of accreditation will contain the following statement: "This report contains data that are not covered by the NVLAP accreditation".

3.2.4.1.11 Each test report bearing the NVLAP term or logo shall include a statement that the report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

3.2.4.1.12 When the NVLAP term or logo is used in a contract or proposal, a description of CEI Labs' scope of accreditation and current accreditation status shall be given in writing.

3.3 Electronic Correspondence with NVLAP

3.3.1 NVLAP will use e-mail in lieu of paper communications where possible. The scope of this policy includes official NVLAP notices (NVLAP Policy Guides, NVLAP Lab Bulletins, and Assessor Bulletins) and other communications that can be accomplished effectively via this means.

3.3.2 CEI, Inc. will ensure that NVLAP is not filtered out by spam blocking software or classified as "junk" e-mail.

3.3.3 NVLAP electronic contacts:

3.3.3.1 Questions regarding receipt of applications or payments: http://ts.nist.gov/Standards/Accreditation/staff.cfm

3.3.3.2 Requests for scope expansion or scope changes http://ts.nist.gov/Standards/Accreditation/staff.cfm

3.3.3.3 Questions about applying for accreditation through the NVLAP Interactive Web Site (NIWS) – niwshelp@nist.gov

3.3.3.4 General customer service inquiries : nvlap@nist.gov

4.0 Quality System Documents

4.1 Indoor Air Quality Laboratory (IAQ Lab)

4.1.1 CEI's IAQ Lab maintains the current version of the following primary Quality System Documents:

4.1.1.1 *CEI Labs, Inc. Standard Operations and Procedures: Method 110: Quantifying and Identifying Airborne Fungi Spores From Spore Traps"Preparation and Analysis of Spore Trap Cassettes via Optical Microscopy"*

4.1.2 The Quality Manager of the IAQ Lab controls all quality system documents that specifically pertain to IAQ Testing.

4.2 Phase Contrast Laboratory (PCM Lab)

4.2.1 CEI's PCM Lab maintains the current version of the following primary Quality System Documents:

4.2.1.1 *CEI Labs, Inc. Standard Operations and Procedures: Method 100: Quantifying Fibers by PCM "Preparation and Analysis of Fibers via Phase Contrast Microscopy"*

4.2.2 The Quality Manager of the PCM Lab controls all quality system documents that specifically pertain to PCM Testing.

4.3 Transmission Electron Microscopy Laboratory (TEM Lab)

4.3.1 CEI's PCM Lab maintains the current version of the following primary Quality System Documents:

4.3.1.1 *CEI Labs, Inc. Standard Operations and Procedures: Method 300: Quantifying Fibers by TEM "Preparation and Analysis of Fibers via Transmission Electron Microscopy"*

4.3.2 The Quality Manager of the TEM Lab controls all quality system documents that specifically pertain to TEM Testing.

4.4 Polarized Light Microscopy Laboratory (PLM Lab)

4.4.1 CEI's PCM Lab maintains the current version of the following primary Quality System Documents:

4.2.1.1 *CEI Labs, Inc. Standard Operations and Procedures: Method 400: Bulk Analysis by PLM "Preparation and Analysis of Bulk Asbestos Material via Polarized Light Microscopy"*

4.2.2 The Quality Manager of the PLM Lab controls all quality system documents that specifically pertain to PLM Testing.

4.5 Supporting Quality System Documents

4.5.1 Each Department at CEI Labs contains a library of supporting documentation referenced in the methods utilized by those departments.

4.5.2 CEI maintains a Master List of Documents, of which includes all approved documents used by all of CEI's laboratories.

4.5.3 The Master List of Documents is updated annually and as needed. The Master List of Documents includes the most current version of each document used by CEI's laboratories.

4.5.4 Data reduction and validation elements of specific methods, calculations, and statistically-derived acceptance limits used to construct CEI Methods and Standard Operating Procedures are referenced in each specific procedure.

APPENDIX I: CEI STAFF

EMPLOYEE COMPLIANCE STATEMENT

STAFF AND RESPONSIBILITIES

DEPUTIES TO KEY PERSONNEL

STAFF AUTHORIZED FOR DATA REVIEW

Employee Compliance Statement:

As an employee of CEI Labs, Inc., I have read the *CEI Labs, Inc. Quality Assurance Manual* and/or sections that apply to my position within the company and agree to comply with any and all statements contained within. I realize that deviation from the quality assurance procedures could result in a corrective action and reprimand, and further deviation could result in termination.

Tianbao Bai, PhD., CIH, Laboratory Director — Date: 1/29/15

Gary Swanson, CEI Quality Manager — Date: 01/27/2015

Marti Bowers, IAQ/PCM Technical and Quality Manager — Date: 1/27/15

Anna Malmberg, PLM Technical Manager — Date: 1/27/2015

Kamila Reichert, TEM Technical and Quality Manager — Date: 1/28/2015

Megan Fisher — Date: 1/29/15

Megan Rumble — Date: 1/29/15

Samantha Card — Date: 1-27-15

Ritika Seal — 1/27/15
Ritika Seal — Date

Susannah Small — 01/27/15
Susannah Small — Date

Shilpa Ladekar — 01/27/15
Shilpa Ladekar — Date

Elizabeth Godwin — 1/27/15
Elizabeth Godwin — Date

Sarah Talley — 1-27-15
Sarah Talley — Date

Ryan Williams — 1-27-15
Ryan Williams — Date

Candace Burrus — 1/27/15
Candace Burrus — Date

Ella Nguyen — 1/27/15
Ella Nguyen — Date

Daniel Liguori — 1-27-15
Daniel Liguori — Date

Greg Ruff — Date: 1/27/15

Taylor Metcalf — Date: 1-28-15

Laura Bostwick — Date: 1-27

Vidya Natarajan — Date: 1/29/15

Audrey Bui — Date: 1/27/15

Diana Sedito — Date: 1/28/15

Samantha Davi — Date: 1/27/15

Yllka Pulaha — Date: 01/28/15

Lauren Mullenex — Date: 1/27/15

Antonia Hoyland — Date: 1/27/15

Additional Employees

Printed Name	Signature	Date
Printed Name	Signature	Date
Printed Name	Signature	Date
Printed Name	Signature	Date
Printed Name	Signature	Date
Printed Name	Signature	Date
Printed Name	Signature	Date
Printed Name	Signature	Date
Printed Name	Signature	Date

CEI Labs, Inc.

Position Title: LABORATORY DIRECTOR

Designee: Tianbao Bai, PhD, CIH

Description of Responsibilities:

The Laboratory Director is responsible for all laboratory operations and the Quality Assurance Program. This includes, but is not limited to: laboratory accreditation status, the training of personnel, calibration of equipment, sample handling and login procedures, contamination control and worker safety in the laboratory, maintenance of appropriate records, implementation of Inter- and Intra-laboratory QC programs, overall accuracy/precision of laboratory data, and supervision of all personnel. The laboratory director is responsible for assuring all employees are compliant with ISO/IEC 17025, the CEI QA Manual, CEI SOP manuals and the pertinent policies of the AIHA.

Dr. Tianbao Bai may perform, but not be limited to performing, the following Approved Test Methods and Procedures:

PCM Asbestos Air: NIOSH 7400, Issue 2
EPA 600 - PLM, Point Count, TEM
TEM Asbestos Air: AHERA, EPA Level II, NIOSH 7402
TEM Wipe and Microvac Dust Samples
Particle Identification
Mold Spore Trap Analysis – CEI Labs, Inc Method
Mold Wipe / Tape Lift Analysis – CEI Labs, Inc. Method
Data review for all test reports

Authorizing Signature _____ Date: 1/29/15

Tianbao Bai, PhD, CIH
CEI Laboratory Director

CEI Labs, Inc.

Position Title: QUALITY MANAGER, CEI LABS

Designee: Gary A. Swanson

Description of Responsibilities:

The Quality Manager is responsible for implementing the Quality Assurance Program on a daily basis. This includes, but is not limited to: calibration of equipment, sample handling and login, worker safety and contamination control in the laboratory, analysis of QC data, resolution of analytical discrepancies, evaluation of the monthly QC data, and maintenance of appropriate records. The quality manager is responsible for assuring all employees are compliant with ISO/IEC 17025, the CEI QA Manual, CEI SOP manuals and the pertinent policies of the AIHA. Mr. Swanson acts as the Trainer for PCM and PLM Laboratories. Develops SOP's, Quality Assurance, and Training Procedures. Oversees procurement of laboratory equipment and supplies.

Gary A. Swanson may perform, but not be limited to performing, the following Approved Test Methods and Procedures:

PCM Asbestos Air: NIOSH 7400 Issue 2
Bulk Asbestos Analysis: EPA 600 - PLM, Point Count, TEM
TEM Asbestos Air: AHERA, EPA Level II, NIOSH 7402 (after re-training)
TEM Wipe and Microvac Dust Samples (after re-training)
Data review for PLM, PCM, TEM, subcontracted Metals Test Reports

Authorizing Signature _____ Date: 1/29/15

Tianbao Bai, PhD, CIH
CEI Laboratory Director

CEI Labs, Inc.

Position Title: QUALITY / LABORATORY <TECHNICAL> MANAGER (IAQ LAB & PCM LAB)

Designee: Marti Bowers

Description of Responsibilities:

The Quality Manager is responsible for implementing the Quality Assurance Program on a daily basis. This includes, but is not limited to: calibration of equipment, sample handling and login, worker safety and contamination control in the laboratory, analysis of QC data, resolution of analytical discrepancies, evaluation of the monthly QC data, and maintenance of appropriate records. The quality manager is responsible for assuring all employees are compliant with ISO/IEC 17025, the CEI QA Manual, CEI SOP manuals and the pertinent policies of the AIHA.

Laboratory Manager is the title given for the laboratory's technical manager. The Laboratory manager is responsible for implementing CEI's Quality Assurance Program. This includes, but is not limited to: sample handling and login, worker safety and contamination control in the laboratory, and supervision of all laboratory personnel. The Laboratory Manager oversees production-related planning and workload for the laboratory. The Laboratory Manager is responsible for assuring all employees are compliant with ISO/IEC 17025, the CEI QA Manual, CEI SOP manuals and the pertinent policies of the AIHA.

Marti Bowers may perform, but not be limited to performing, the following Approved Test Methods and Procedures:

Mold Spore Trap Analysis – CEI Labs, Inc. Method
Mold Wipe / Tape Lift Analysis – CEI Labs, Inc. Method
PCM Asbestos Air: NIOSH 7400 Issue 2
Data Review for IAQ & PCM Laboratory Test Reports

Authorizing Signature _____ Date: 1/29/15

Tianbao Bai, PhD, CIH
CEI Laboratory Director

CEI Labs, Inc.

Position Title: QUALITY MANAGER (PLM LAB)

Designee: Gary Swanson

Description of Responsibilities:

The Quality Manager is responsible for implementing the Quality Assurance Program on a daily basis. This includes, but is not limited to: calibration of equipment, sample handling and login, worker safety and contamination control in the laboratory, analysis of QC data, resolution of analytical discrepancies, evaluation of the monthly QC data, and maintenance of appropriate records.

The Quality Manager is responsible for assuring all employees are compliant with ISO/IEC 17025, the CEI QA Manual, CEI SOP manuals and the pertinent policies of NVLAP (NIST Handbook 150, and 150-3).

Megan Fisher may perform, but not be limited to performing, the following Approved Test Methods and Procedures:

Bulk Asbestos Analysis: EPA 600 - PLM, Point Count

Authorizing Signature _____ Date: 1/29/15

Tianbao Bai, PhD, CIH
CEI Laboratory Director

CEI Labs, Inc.

Position Title: LABORATORY MANAGER (PLM LAB)
<TECHNICAL MANAGER>

Designee: Anna Malmberg, M.S.

Description of Responsibilities:

Laboratory Manager is the title given for the laboratory's technical manager. The Laboratory manager is responsible for implementing CEI's Quality Assurance Program. This includes, but is not limited to: sample handling and login, worker safety and contamination control in the laboratory, and supervision of all laboratory personnel. The Laboratory Manager oversees production-related planning and workload for the laboratory. The Laboratory Manager is responsible for assuring all employees are compliant with ISO/IEC 17025, the CEI QA Manual, CEI SOP manuals and the pertinent policies of the AIHA.

Anna Malmberg may perform, but not be limited to performing, the following Approved Test Methods and Procedures:

PCM Asbestos Air: NIOSH 7400 Issue 2 (requires re-certification by laboratory)
Bulk Asbestos Analysis: EPA 600 - PLM, Point Count
Data review for PLM, PCM & Subcontracted Metals Reports

Authorizing Signature _____ Date: 1/29/15

Tianbao Bai, PhD, CIH
CEI Laboratory Director

CEI Labs, Inc.

Position Title: QUALITY / LABORATORY MANAGER
<TECHNICAL MANAGER> (TEM LAB)

Designee: Kamila Reichert

Description of Responsibilities:

The Quality Manager is responsible for implementing the Quality Assurance Program on a daily basis. This includes, but is not limited to: calibration of equipment, sample handling and login, worker safety and contamination control in the laboratory, analysis of QC data, resolution of analytical discrepancies, evaluation of the monthly QC data, and maintenance of appropriate records. The quality manager is responsible for assuring all employees are compliant with ISO/IEC 17025, the CEI QA Manual, CEI SOP manuals and the pertinent policies of NVLAP (NIST Handbook 150, and 150-13).

Laboratory Manager is the title given for the laboratory's technical manager. The Laboratory manager is responsible for implementing CEI's Quality Assurance Program. This includes, but is not limited to: sample handling and login, worker safety and contamination control in the laboratory, and supervision of all laboratory personnel. The Laboratory Manager oversees production-related planning and workload for the laboratory. The Laboratory Manager is responsible for assuring all employees are compliant with ISO/IEC 17025, the CEI QA Manual, CEI SOP manuals and the pertinent policies of the NVLAP (NIST Handbook 150 and 150-13).

Kamila Reichert may perform, but not be limited to performing, the following Approved Test Methods and Procedures:

EPA 600 - PLM, Point Count, TEM
TEM Asbestos Air: AHERA, EPA Level II, NIOSH 7402
TEM Wipe and Microvac Dust Samples
Data Review for TEM test reports.

Authorizing Signature _____ Date: 1/29/15

Tianbao Bai, PhD, CIH
CEI Laboratory Director

CEI Labs, Inc.

Position Title: LABORATORY ANALYST (PCM LAB)

Designee: Gary Swanson, Marti Bowers, Antonia Hoyland, Audrey Bui

Description of Responsibilities:

Laboratory Analysts perform analysis of PCM samples using the NIOSH 7400 method. They are responsible for the accuracy and precision of the work they perform. Laboratory Analysts routinely work under the supervision of the Laboratory Director and the Quality Manager in implementing QA/QC procedures on a daily basis. Responsibilities include, but are not limited to: daily calibration of equipment, sample handling and login, sample preparation and analysis, contamination control in the laboratory, implementation of worker safety procedures, and report generation. The Laboratory Analysts are responsible for complying with ISO/IEC 17025, the CEI QA Manual, CEI SOP manuals and the pertinent policies of the AIHA.

PCM Laboratory Analysts may perform, but not be limited to performing, the following Approved Test Methods and Procedures:

PCM Asbestos Air: NIOSH 7400 Issue 2

Authorizing Signature _____ Date: 1/29/15

Tianbao Bai, PhD, CIH
CEI Laboratory Director

CEI Labs, Inc.

Position Title: MICROBIOLOGICAL ANALYST (IAQ LAB)

Designee: Marti Bowers, Vidya Natarajan, Tianbao Bai, PhD, CIH

Description of Responsibilities:

Microbiological Analysts are responsible for performing work submitted to the Indoor Air Quality Laboratory using methods approved by CEI. They are responsible for the accuracy and precision of the work they perform. Laboratory Analysts routinely work under the supervision of the Laboratory Director and the Quality Manager in implementing QA/QC procedures on a daily basis. Responsibilities include, but are not limited to: daily calibration of equipment, sample handling and login, sample preparation and analysis, contamination control in the laboratory, implementation of worker safety procedures, and report generation. The Laboratory Analysts are responsible for complying with ISO/IEC 17025, the CEI QA Manual, CEI SOP manuals and the pertinent policies of the AIHA.

Microbiological Analysts may perform, but not be limited to performing, the following Approved Test Methods and Procedures:

Mold Spore Trap Analysis – CEI Labs, Inc. Method
Mold Wipe / Tape Lift Analysis – CEI Labs, Inc. Method

Authorizing Signature _____ Date: 1/29/15

Tianbao Bai, PhD, CIH
CEI Laboratory Director

CEI Labs, Inc.

Position Title: LABORATORY ANALYST (PLM LAB)

Designee: Tianbao Bai, Gary Swanson, Anna Malmberg, Greg Ruff, Susannah Small, Megan Fisher, Samantha Card, Daniel Liguori, Candace Burrus, Megan Rumble, Elizabeth Godwin, Ritika Seal, Taylor Metcalf, Ella Nguyen, Sarah Talley, Ryan Williams, Shilpa Ladekar.

Description of Responsibilities:

Laboratory Analysts perform analysis of PLM samples using the EPA 600 method. They are responsible for the accuracy and precision of the work they perform. Laboratory Analysts routinely work under the supervision of the Laboratory Director and the Quality Manager in implementing QA/QC procedures on a daily basis. Responsibilities include, but are not limited to: daily calibration of equipment, sample handling and login, sample preparation and analysis, contamination control in the laboratory, implementation of worker safety procedures, and report generation. The Laboratory Analysts are responsible for complying with ISO/IEC 17025, the CEI QA Manual, CEI SOP manuals and the pertinent policies of the NVLAP (NIST Handbook 150 and 150-3)

PLM Laboratory Analysts may perform, but not be limited to performing, the following Approved Test Methods and Procedures:

EPA 600 - PLM, Point Count

Authorizing Signature _____ Date: 1/29/15

Tianbao Bai, PhD, CIH
CEI Laboratory Director

CEI Labs, Inc.

Position Title: LABORATORY ANALYST (TEM LAB)

Designee: Tianbao Bai, Kamila Reichert, Gary Swanson, Diana Sedito, Susannah Small, Daniel Liguori (trainee), Yllka Pulaha (trainee)

Description of Responsibilities:

Laboratory Analysts perform analysis of TEM samples using the AHERA method. They are responsible for the accuracy and precision of the work they perform. Laboratory Analysts routinely work under the supervision of the Laboratory Director and the Quality Manager in implementing QA/QC procedures on a daily basis. Responsibilities include, but are not limited to: daily calibration of equipment, sample handling and login, sample preparation and analysis, contamination control in the laboratory, implementation of worker safety procedures, and report generation. The Laboratory Analysts are responsible for complying with ISO/IEC 17025, the CEI QA Manual, CEI SOP manuals and the pertinent policies of the NVLAP (NIST Handbook 150 and 150-13)

TEM Laboratory Analysts may perform, but not be limited to performing, the following Approved Test Methods and Procedures:

All Analysts:
EPA 600 – TEM
All Analysts excluding Susannah Small, Daniel Liguori, Gary Swanson:
AHERA Method for Asbestos in Air
TEM Wipe and Microvac Dust Samples
NIOSH 7402 Method for Asbestos in Air
TEM Soil – ASTM D7521-13
TEM Vermiculite – Cincinnati Method.

Authorizing Signature _____ Date: 1/29/15

Tianbao Bai, PhD, CIH
CEI Laboratory Director

CEI Labs, Inc.

Position Title: LABORATORY TECHNICIAN (PCM LAB)

Designee: Samantha Davi, Lauren Mellenex, Susannah Small, Vidya Natarajan, All PCM Analysts

Description of Responsibilities:

Laboratory Technicians are responsible for sample login, sample preparation, daily cleaning of the sample preparation area, creating additional preparations in accordance with the Quality Assurance Program, and entering data and generating reports from that data. The Laboratory Technicians are responsible for complying with ISO/IEC 17025, the CEI QA Manual, CEI SOP manuals and the pertinent policies of the AIHA.

PCM Technicians may perform, but not be limited to performing, the following Approved Test Methods and Procedures:

PCM sample preparation using NIOSH 7400 Issue 2 procedures
Generating Sample Reports using the CEI's PCM SOP

Authorizing Signature _____ Date: 1/29/15

Tianbao Bai, PhD, CIH
CEI Laboratory Director

CEI Labs, Inc.

Position Title: LABORATORY TECHNICIAN (IAQ LAB)

Designee: Tianbao Bai, Marti Bowers, Vidya Natarajan

Description of Responsibilities:

Laboratory Technicians are responsible for sample login, sample preparation, media preparation, and daily cleaning of the sample preparation room in accordance with the Quality Assurance Program. The Laboratory Technicians are responsible for complying with ISO/IEC 17025, the CEI QA Manual, CEI SOP manuals and the pertinent policies of the AIHA.

IAQ Lab Technicians may perform, but not be limited to performing, the following Approved Test Methods and Procedures:

Spore Trap sample preparation using the CEI Labs, Inc. Method
Bulk Mold preparation using CEI developed procedures

Authorizing Signature _____ Date: 1/29/15

Tianbao Bai, PhD, CIH
CEI Laboratory Director

CEI Labs, Inc.

Position Title: LABORATORY TECHNICIAN (TEM LAB)

Designee: Tianbao Bai, Kamila Reichert, Susannah Small, Gary Swanson, Samantha Davi, Yllka Pulaha (trainee), Daniel Liguori (trainee)

Description of Responsibilities:

Laboratory Technicians are responsible for sample login, sample preparation, media preparation, and daily cleaning of the sample preparation room in accordance with the Quality Assurance Program. The Laboratory Technicians are responsible for complying with ISO/IEC 17025, the CEI QA Manual, CEI SOP manuals and the pertinent policies of the NVLAP (NIST Handbook 150 and 150-13).

TEM Lab Technicians may perform, but not be limited to performing, the following Approved Test Methods And Procedures:

Preparation of air samples for TEM Analysis by AHERA rules.
Preparation of air samples for NIOSH 7402 Analysis
Preparation of bulk asbestos samples by EPA 600 method.
Preparation of dust microvac and wipe samples by ASTM methods.

Authorizing Signature _____ Date: 1/29/15

Tianbao Bai, PhD, CIH
CEI Laboratory Director

CEI Labs, Inc.

Position Title: LABORATORY SECRETARY / OFFICE MANAGER

Designee: Laura Bostwick, Elizabeth Godwin

Description of Responsibilities:

The Laboratory Secretary is responsible for the preparation of final test reports forwarded to customers, maintenance of appropriate customer files, and customer relations.

The Laboratory Secretary may not perform Test Methods or Procedures in the laboratory without first going through the training processes outlined in the Quality Assurance Manual and Laboratory SOP Manuals. He/she shall be trained in to have some knowledge of methodology and procedures so as to communicate vital information to CEI customers.

Authorizing Signature _____ Date: 1/29/15

Tianbao Bai, PhD, CIH
CEI Laboratory Director

CEI Labs, Inc.

Position Title: LOGIN TECHNICIAN

Designee: Antonia Hoyland, Lauren Mullenex, Elizabeth Godwin

Description of Responsibilities:

Login Technicians are responsible for sample receipt. They determine and record the condition and acceptability of samples submitted to CEI, and process and package the samples for analysis. Login technicians create internal chain of custody records and deliver them with the samples to the laboratory

The Login Technician may not perform Test Methods or Procedures in the laboratory without first going through the training processes outlined in the Quality Assurance Manual and Laboratory SOP Manuals. He/she shall be trained in to have some knowledge of methodology and procedures so as to communicate vital information to CEI customers.

Authorizing Signature _____ Date: 1/29/15

Tianbao Bai, PhD, CIH
CEI Laboratory Director

DEPUTIES TO KEY PERSONNEL

Employee	Job Title	Deputy
Tianbao Bai	Laboratory Director (CEI)	Gary Swanson
Gary Swanson	Quality Manager (CEI)	Susannah Small
Marti Bowers	Quality Manager (PCM)	Gary Swanson
Marti Bowers	Laboratory Manager (PCM)	Gary Swanson
Marti Bowers	Laboratory Manager (IAQ)	Tianbao Bai
Marti Bowers	Quality Manager (IAQ)	Tianbao Bai
Anna Malmberg	Laboratory Manager (PLM)	Susannah Small
Gary Swanson	Quality Manager (PLM)	Susannah Small
Kamila Reichert	Laboratory Manager (TEM)	Tianbao Bai
Kamila Reichert	Quality Manager (TEM)	Tianbao Bai

PERSONNEL AUTHORIZED FOR DATA REVIEW

Report Types	Asbestos Test Reports: PLM, PCM	Asbestos Test Reports: TEM	Lead, other Metals, Subcontracted Test Types	IAQ Reports: Spore Trap, Wipe, Tape Lift, Subcontracted Culturables
Authorized Personnel	Tianbao Bai Gary Swanson Anna Malmberg Megan Fisher Susannah Small Audrey Bui (PCM only)	Tianbao Bai Kamila Reichert Gary Swanson Anna Malmberg	Tianbao Bai Gary Swanson Anna Malmberg	Tianbao Bai Marti Bowers Vidya Natarajan

APPENDIX II:

CALCULATION OF UNCERTAINTY

Calculation of Uncertainty (PCM & SPORE TRAP)

In this manual, for spore counting the **measurand** is defined as fungal spores counted on a trace deposited on a glass slide by using spore trap sampling method. The **measureand** is also defined as the number of fibers counted on a prepared MCE filter using NIOSH 7400 method.

Determination of Acceptance of replicate or duplicate analysis: Acceptable levels of variation are determined by comparison of initial counts versus QC counts as follows:

If $ABS(SQRT_{intial} - SQRT_{QC}) \leq 2.77(AVGSQRT)$ (pooled CV/2),

the results are considered acceptable.

The pooled CV is determined by daily reading of reference slides and is determined by:

$CV_{pool} = SQRT\{(CV_1^2 + CV_2^2 + \ldots CV_n^2)/n\}$

This value can change daily based upon the increased or decreased accuracy of an analyst's readings of the reference slides. The reference slides are divided into three groups based upon how many spores or fibers are assumed to be present. These ranges are 10 to100, >100 to 350, and >350 spores per slide trace and 5-20, >20 to 50, and >50 to 100 fibers per 100 graticule fields. The above formula applies to both the spore counting and fiber counting methods.

Expanded Analytical Uncertainty and Bias for Spore Counting

The expanded measurement uncertainty at 95% confidence limit (k=2) equals CV_{pool} x 2. Therefore, the Expanded Analytical Uncertainty equals concentration x Expanded MU@ 95% C. L.

For Example: If the low range has a pooled CV of 0.2, the spore concentration of the sample was 100 Spores/M^3, Expanded analytical uncertainty = 100 Spores/M^3 x 0.2 x 2 = 40 Spores/M^3.

Example of reporting for air sample with 100 Spores/M^3:

100 Spores/M^3 with an analytical uncertainty of +/- 40 Spores/M^3 at the 95% confidence level.

The **Bias** for spore counts cannot be determined because no quantitative reference material is available.

Expanded Analytical Uncertainty and Bias for Fiber Counting

CEI adapt the uncertainty evaluations in the content of the NIOSH 7400 method. The 90% confidence interval can be calculated using the following equations:

$$U_{CL} = \frac{2X + 2.25 + [(2.25 + 2X)^2 - 4(1-2.25CV^2)X^2]^{1/2}}{2(1-2.25CV^2)} \quad \text{and}$$

$$L_{CL} = \frac{2X + 4 - [(4 + 2X)^2 - 4(1-4CV^2)X^2]^{1/2}}{2(1-4CV^2)}$$

Where CV = subject interlaboratory relative standard deviation, which is close to the total interlaboratory CV when approximately 100 fibers are counted,
X = total fibers counted on sample,
L_{CL} = lower 95% confidence limit, and
U_{CL} = upper 95% confidence limit.
The range between these two limits represents 90% of the total range.

Example: if a single filter fiber count is 100 and the CV = 0.2, the calculated U_{CL} = 148% and L_{CL} = 68%. Therefore, if the measured sample concentration is 0.2 fibers/cc, then the mean fiber count by a group of laboratories has a 95% chance of being less than 0.5; i.e., 0.2 + 1.48 x 0.2 = 0.5. Similarly, the mean fiber count by a group of laboratories has a 95% of chance of being greater than 0.06; i.e. 0.2 – 0.68 x 0.2 = 0.06.

The fiber counts are probably **biased** when counts are outside the recommended 100 – 1300 fiber/mm^2 range and should be reported as having “greater than optimal variability” and as being “probably biased”. At low levels, the fiber counts are generally overestimated when compared to results in the recommended analytical range of the method. The fiber counts are generally underestimated when the debris loading on the filter is high. However, a quantitative evaluation of the bias of the fiber counting is not available.

APPENDIX III:

FACTORS DETERMINING CORRECTNESS AND THE RELIABILITY OF RESULTS

Factors Determining the Correctness and Reliability of Results

Factor	Type	Description	Actions to Minimize
Human Factor	B	Errors that could result from mistakes made by personnel	Adequate and updated training. Read reference slides by multiple analysts.
Environmental Conditions	A/B	The presence of spores/fibers/debris in the air which could influence results	Semi-annual air sampling and proper use of fume hood to handle samples. Air sampling results are given a threshold which they must remain within for the laboratory to be a suitable environment for sample handling
Test and Calibration Methods/Validation	B	Methods and calibrations that are not approved or properly validated	Use of only approved methods and strict adherence to SOP Manual
Equipment	B	Equipment that is not functioning properly or is not being properly maintained	Routine checks of the functionality of equipment and analyze reference slides daily
Measurement Traceability	A/B	Measurements taken that cannot be obtained again by using the same methodology as the original test	QC performed on 10% of samples to assure results can be duplicated and replicated
Sampling	B	Improper collection of samples and the use of improper techniques and containers	Samples are collected by professionals and proper procedures are available to anyone with question regarding proper sampling
Handling of Test and Calibration Items	B	Improper handling that damages/changes the sample or equipment that could affect results	Samples and equipment are handled only by trained laboratory personnel
Sample Preparation	A/B	Slides & coverslip contamination	Analyze blanks daily.
Overlapping of Debris or Spores	B	Missed spores or undercounted spores	Clients are encouraged to pull an appropriate amount of air for the conditions present. The manufacturer provides recommendations for conditions and responsibility lies with the sampler to follow these recommendations.
Identification of Spore Types	B	Errors in identification	Errors are minimized by performance of regular QC by the same analyst and another analyst to verify that all genera were noted and properly identified.
Counts	A/B	Errors in counting	Errors are minimized by performance of regular QC by the same analyst and another analyst to verify that all genera/fibers were counted. A chart has been set up to verify by CV and 2.77 test for first kind errors that differences in counts are within acceptable limits. See Uncertainty Calculations.
Counts II	A/B	Errors in counting	Precision is maintained by the daily reading of reference slides. These slides have been read repeatedly to determine an analyst's ability to perform an analysis repeatedly with accuracy. The data are compiled on a graph and a CV determined based on the number of spores/fibers counted each time.
Spores not Present	B	Absence of a spore type	The absence of a genus on the lab report does not mean that is was not present; it simply states that an analyst did not detect it on that sample at the time of analysis or that it is present at a level below the limit of detection

APPENDIX IV
RECORD FORMATS

CUSTOMER CHAIN OF CUSTODY:

1) IAQ COC
2) ASBESTOS (PCM / PLM / TEM) COC
3) LEAD COC

MOLD
CHAIN OF CUSTODY

107 New Edition Court, Cary, NC 27511
Tel: 866-481-1412; Fax: 919-481-1442

LAB USE ONLY:
CEI Lab Code:
CEI Lab I.D. Range:

COMPANY INFORMATION	**PROJECT INFORMATION**
CEI CLIENT #:	Job Contact:
Company:	Email / Tel:
Address:	Project Name:
	Project ID#
Email:	PO #:
Tel: Fax:	**STATE SAMPLES COLLECTED IN:**

IF TAT IS NOT MARKED STANDARD 3 DAY TAT APPLIES.

		TURN AROUND TIME						
MICROBIOLOGY	**METHOD**	**4 HR***	**8 HR***	**24 HR**	**2 DAY**	**3 DAY**	**5 DAY**	**7-10 DAY**
MOLD NON-VIABLE	TAPE LIFT, BULK, SWAB	☐	☐	☐	☐	☐	☐	
MOLD NON-VIABLE	SPORETRAP	☐	☐	☐	☐	☐	☐	
MOLD VIABLE	IMPACTOR							☐
MOLD VIABLE	BULK, SWAB, DUST							☐
DUST CHARACTERIZATION	PLM	☐	☐	☐	☐	☐	☐	☐
OTHER:		☐	☐	☐	☐	☐	☐	☐

FIELD ID #	**SAMPLE LOCATION**	**AREA (SQ. INCH)**	**VOLUME (LITRES)**

REMARKS:	☐ Accept Samples ☐ Reject Samples

Relinquished By:	**Date/Time**	**Received By:**	**Date/Time**

Samples will be disposed of 30 days after analysis

MOLD
SAMPLING FORM

COMPANY CONTACT INFORMATION	
Company:	Job Contact:
Project Name:	
Project ID #:	Tel:

FIELD ID #	SAMPLE LOCATION	AREA (SQ. INCH)	VOLUME (LITRES)

ASBESTOS
CHAIN OF CUSTODY

107 New Edition Court, Cary, NC 27511
Tel: 866-481-1412; Fax: 919-481-1442

LAB USE ONLY:
CEI Lab Code:
CEI Lab I.D. Range:

COMPANY INFORMATION	**PROJECT INFORMATION**
CEI CLIENT #:	Job Contact:
Company:	Email / Tel:
Address:	Project Name:
	Project ID#
Email:	PO #:
Tel: Fax:	**STATE SAMPLES COLLECTED IN:**

IF TAT IS NOT MARKED STANDARD 3 DAY TAT APPLIES.

		TURN AROUND TIME					
ASBESTOS	**METHOD**	**4 HR**	**8 HR**	**24 HR**	**2 DAY**	**3 DAY**	**5 DAY**
PLM BULK	EPA 600	☐	☐	☐	☐	☐	☐
PLM POINT COUNT (400)	EPA 600	☐	☐	☐	☐	☐	☐
PLM POINT COUNT (1000)	EPA 600	☐	☐	☐	☐	☐	☐
PLM GRAV w POINT COUNT	EPA 600		☐	☐	☐	☐	☐
PLM BULK	CARB 435		☐	☐	☐	☐	☐
PCM AIR	NIOSH 7400	☐	☐	☐	☐	☐	☐
TEM AIR AHERA	EPA AHERA	☐	☐	☐	☐	☐	☐
TEM AIR NIOSH	NIOSH 7402	☐	☐	☐	☐	☐	☐
TEM AIR ISO	ISO 13794	☐	☐	☐	☐	☐	☐
TEM AIR ASTM	ASTM 6281-09	☐	☐	☐	☐	☐	☐
TEM BULK	CHATFIELD		☐	☐	☐	☐	☐
TEM DUST WIPE	ASTM D6480-05	☐	☐	☐	☐	☐	☐
TEM DUST MICROVAC	ASTM D5755-09	☐	☐	☐	☐	☐	☐
TEM SOIL	ASTM D7521-13			☐	☐	☐	☐
TEM VERMICULITE	CINCINNATI METHOD			☐	☐	☐	☐
OTHER:		☐	☐	☐	☐	☐	☐

REMARKS / SPECIAL INSTRUCTIONS:	☐ Accept Samples ☐ Reject Samples

Relinquished By:	**Date/Time**	**Received By:**	**Date/Time**

Samples will be disposed of 30 days after analysis

ASBESTOS
SAMPLING FORM

COMPANY CONTACT INFORMATION	
Company:	Job Contact:
Project Name:	
Project ID #:	Tel:

SAMPLE ID#	DESCRIPTION / LOCATION	VOLUME/ AREA	TEST	
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
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			PLM ☐	TEM ☐
			PLM ☐	TEM ☐

METALS
CHAIN OF CUSTODY

107 New Edition Court, Cary, NC 27511
Tel: 866-481-1412; Fax: 919-481-1442

LAB USE ONLY:
CEI Lab Code:
CEI Lab I.D. Range:

COMPANY INFORMATION	**PROJECT INFORMATION**
CEI CLIENT #:	Job Contact:
Company:	Email / Tel:
Address:	Project Name:
	Project ID#
Email:	PO #:
Tel: Fax:	**STATE SAMPLES COLLECTED IN:**

IF TAT IS NOT MARKED STANDARD 3 DAY TAT APPLIES.

		TURN AROUND TIME					
ASBESTOS	**METHOD**	**4 HR****	**8 HR****	**24 HR****	**2 DAY**	**3 DAY**	**5 DAY**
LEAD PAINT	EPA SW846 7000B				☐	☐	☐
LEAD WIPE	EPA SW846 7000B				☐	☐	☐
LEAD SOIL	EPA SW846 7000B				☐	☐	☐
LEAD AIR	NIOSH 7082				☐	☐	☐
LEAD TCLP	EPA SW846 7000B				☐	☐	☐
RCRA 8 METALS	EPA SW846 7000B				☐	☐	☐
RCRA 8 TCLP	EPA SW846 7000B				☐	☐	☐
OTHER:					☐	☐	☐

*****TAT IS NOT AVAILABLE. LEAD SAMPLES ARE SUBCONTRACTED FOR ANALYSIS TO AN ELLAP ACCREDITED LAB.***

REMARKS:	☐ Accept Samples ☐ Reject Samples

Relinquished By:	**Date/Time**	**Received By:**	**Date/Time**

Samples will be disposed of 30 days after analysis

METALS
SAMPLING FORM

COMPANY CONTACT INFORMATION	
Company:	Job Contact:
Project Name:	
Project ID #:	Tel:

SAMPLE ID#	DESCRIPTION / LOCATION	VOLUME/AREA	COMMENTS

CHAIN OF CUSTODY
LABORATORY

CHAIN OF CUSTODY

LABORATORY ANALYSIS

CLIENT:

VOICE:

FAX:

PURCHASE ORDER:

AMENDED: ☐

CLIENT CODE: SINCE: CONTACT:

PROJECT:

LAB CODE:

TURN AROUND:

CEI JOB #:

DATE/TIME REC'D: 11-01-12

DATE/TIME DUE:

RECEIVED BY:

ASSIGNEE:

CONFIRMATION SENT: No

FAX TO:

EMAIL TO:

SAMPLE TYPE	QTY	LAB ID Range

Mastic Layers

Total Layers

☐ Show on PLM Report?

	INITIALS	DATE	TIME
SAMPLE PREP BY:			
ANALYZED BY:			
REPORT GENERATED BY:			
SAMPLES SUBMITTED FOR TEM: ☐ Y ☐ N			
REVIEWED BY:			
SCANNED BY:			
REPORTED BY:			

On Time? Late (Min)

NOTES:

COMMENTS:

ASBESTOS TIER: MOLD TIER: TEM TIER: EMAIL INVOICES:

Version: LCOC.1012.1./1.LD

DOCUMENT APPROVAL WORKSHEET

CEI LABS
Document Approval Worksheet

Date Submittted: _____

Submitted by: _____

Document Name: _____

Document Version:_____

_____

Circle one: **Original** **/** **Revision**

_____

This document has been approved for use at CEI by the Laboratory Director, and the Quality Manager.

Laboratory Director (Dr. Tianbao Bai)_____

Quality Manager ( ) _____

Other Notes:

_____
_____
_____
_____
_____
_____
_____

QC/QA AMENDED REPORT WORKSHEET

QC / QA AMENDED REPORT WORKSHEET

REPORT #: A15-0[redacted] **DATE:** 1/22/2015

CLIENT: [redacted]

CLIENT CONTACT: [redacted]

REASON FOR AMENDED REPORT

CATEGORY: Client Wishes to Change Specifications for Analysis

TYPE: Composite Layers

AMENDMENT INFO

SAMPLE NUMBER: A1900781

RESOLUTION: Composited DW/JC

CEI COMMENT: Composited DW/JC

CLIENT COMMENT:

CUSTOMER SATISFACTION

CUSTOMER NOTIFIED OF CHANGE TO REPORT? Y

DID CUSTOMER EXPRESS SATISFACTION WITH CHANGE? Y

AMENDED BY: SS **DATE:** 1/22/2015 2:42:26 PM

CORRECTIVE ACTION REPORT

CEI LABS
Corrective Action Report for Non-conforming Events

Date: _____ Incident Investigator _____

Incident:

Root Cause Analysis:

Outcome of Investigation:

Proposed Corrective Action:

Date of Implementation of Corrective Action _____

Verification of Effectiveness of Corrective Action:

CORRECTIVE ACTION REPORT
Complaints

CEI LABS
Corrective Action Report for Non-conforming Events

Date: _____ Incident Investigator _____

Incident: Complaint from (circle) Customer CEI Employee Accred. Agency Other

Name of Entity/Person Issuing Complaint _____
Summarize the complaint below:

Root Cause Analysis: The following statement(s) were found to be true in the course of the investigation.

Outcome of Investigation:
Was the complaint validated by the investigation? Yes No

If no, describe in detail the circumstances that invalidated the complaint:

Proposed Corrective Action: Add additional pages if necessary.

Date of Implementation of Corrective Action _____

Verification of Effectiveness of Corrective Action:

CORRECTIVE ACTION REPORT
Customer COC Error

CEI LABS
Corrective Action Report for Non-conforming Events

Date: _____ Incident Investigator _____

Incident: The customer chain of custody form was incomplete.

Root Cause Analysis:
Which necessary information was incomplete on the custody form (circle)?

TAT Volume/Area Test Type Sample ID No COC Other (describe below)

Was the customer contacted? Yes No

Name of customer contact: _____

Outcome of Investigation:
Describe any conversation you had with the customer regarding incomplete COC form:

Proposed Corrective Action: Obtain information from customer to complete work.

Did the customer provide the information to complete the work? Yes No

Did the customer provide the information in writing? Yes No

Date of Implementation of Corrective Action:

Date and Time Work was Permitted to Commence: _____

CEI Project Code for Submitted Test Items _____

Verification of Effectiveness of Corrective Action: Work was able to commence on the submitted test items.

EQUIPMENT MANUAL/MAINENANCE LOG

1) EQUIPMENT DESCRIPTION WORKSHEET

2) EQUIPMENT MAINTENANCE RECORD

EQUIPMENT DESCRIPTION WORKSHEET

ITEM :

MANUFACTURER:

SERIAL NUMBER:

LABORATORY DESIGNATION:

LOCATION:

CALIBRATION SOURCE:

CALIBRATION PROTOCOL:

CALIBRATION FREQUENCY:

PURCHASE DATE:

INSTALLATION DATE:

MAINTENANCE CONTACT:

MAINTENANCE PROTOCOL:

LIGHT/ENERGY SOURCE:

EQUIPMENT MAINTENANCE RECORD

ITEM:

SERIAL NUMBER:

LABORATORY DESIGNATION:

ACTIONS: CL=CLEANING, R= REPLACE PART, O=OTHER ACTION, CA=CALIBRATION

Date	Action	Problem/Cause	Date returned to service.

LABORATORY HOOD TEST RECORD

CEI LABS, INC.
LABORATORY HOOD TEST RECORD

DATE: _____

HOOD NUMBER: _____

HOOD LOCATION: _____

PERFORMED BY: _____

TEST EQUIPMENT: ALNOR Model 9880

FILTER CONDITION: Excellent, Good, Fair, Poor

CONDITIONS DURING TEST:_____

_____

READINGS: #1_____ #2_____ #3_____

#4_____ #5_____ #6_____

#7_____ #8_____ #9_____

AVERAGE:_____

I**S THE AVERAGE GREATER THAN 60 FPM?** YES NO

Witnessed by:_____ Date:_____

All readings are in feet per minute (fpm). Hood front opening is visually divided to 9 equal areas and readings are taken from the center of each area.

LABORATORY SUPPLIES RECORD

Laboratory Supplies Record

DATE	ITEM NAME	CATALOG / ITEM NO.	QUANTITY	SUPPLIER NAME	RECV'D BY	DATE RECEIVED	LOT NUMBER	CONDITION

REPORT REVIEW PROCEDURE

CEI LABS

STANDARD OPERATING PROCEDURES

Method 210: STANDARD PROCEDURES FOR REPORT REVIEW

"Reviewing CEI Test Reports to Ensure Quality Analysis"

CEI Labs, Inc.
Method Number: CEI 210
REPORT REVIEW SOP
Revision: February 2014

1.0 Scope and Application

1.1 CEI designates qualified personnel to review final reports. The CEI Quality Assurance Manual lists the qualified personnel for each department. The report review serves to ensure reports are released to the customer with data that are correct and applicable to the test performed.

2.0 Summary of Method

2.1 Reports are completed by qualified CEI personnel. Each department has a designated area where reports are to be submitted for review. After qualified CEI personnel review the reports, they are submitted to the laboratory's secretary for delivery to the customer.

3.0 Qualified Personnel

3.1 The Laboratory Director approves certain personnel, who have undergone training with regards to report review procedures, as "qualified" to review laboratory test reports. A record of this training is maintained by the Quality Manager. The personnel chosen may be approved for reviewing test reports of one or more disciplines practiced by the laboratory.

3.2 Only the Laboratory Director / Laboratory Manager / Quality Manager or their authorized designees with appropriate training are allowed to review reports.

3.3 A list of personnel authorized to implement data review procedures can be found in Appendix I of the *CEI Quality Assurance Manual*.

4.0 All Reports

4.1 Ensure that the project number matches the report and the client name on the report matches the client name on the Customer Chain of Custody;

4.2 Ensure that CEI project code on the report matches the Laboratory chain of custody;

4.3 Verify that all pages of the report are included;

4.4 Verify that all pertinent information is correctly transmitted to the report (sample volume, sample number, fiber counts, etc.);

4.5 Ensure that the data entry fields are clear if the sample is not analyzed;

4.6 Ensure that the total number of samples on the report matches the total number of samples logged-in;

5.0 PLM Reports

5.1 Ensure that the number of mastic layers and multiple samples are recorded;

5.2 Check for positive stop and other special requests and make sure they are followed;

5.3 Ensure that the actual number of samples analyzed is updated;

5.4 Ensure that no “copy/paste” errors are present.

5.5 Personnel that are responsible for data review must check the Project Due Now bin periodically (at least once per hour) so that CEI meets test report deadlines. Sort the Project Due later bin regularly to ensure somebody did not accidentally put a test report the wrong bin. In addition, all test reports due before 9:00 am the next day shall be reviewed and emailed before the end of the 2nd shift.

6.0 PCM Reports

6.1 Make sure customer is not charged for samples not prepped (filter damaged, too wet to prep).

6.2 Verify File Maker Pro’s programming and calculations weekly.

7.0 TEM Reports

7.1 Ensure proper number of prep charges and analytical charges are correct.

7.2 Ensure the calculations are correct.

7.2.1 Verify File Maker Pro’s programming and calculations quarterly.<<<

8.0 IAQ Reports

8.1 Verify counts on test report match up to the hard copy bench worksheets.

8.2 Verify all genus types identified on test report match up to the hard copy bench worksheets.

8.3 Verify File Maker Pro's programming and calculations weekly.

9.0 Send Test Report to the Customer

9.1 If all above information is verified correct, initial and provide the date and time of data review on the Laboratory Chain of Custody.

9.2 If test reports contain any errors, have them corrected by the party at fault, and then the reports must be resubmitted for data review.

9.3 Deliver reviewed test report to the Laboratory Secretary for scanning and reporting of test items to the customer.

9.4 Test Reports are delivered to the customer by e-mail, fax, courier, or U.S. Mail.

VERIFICATION OF ELECTRONIC DOCUMENT FUNCTIONALITY

CEI Labs, Inc.
Verification of Functionality of Computerized Spreadsheets and Calculations

Date _____ **Name of Calculation or Function**_____-

Platform Tested (Choose one) : Microsoft Excel Filemaker Pro Other _____

	Computer/Electronic Calculation	Hand Calculation
Equation	Write Electronically Programmed Equation Here:	Write Equation for Hand Calculation Here:
Result	Result Obtained by Electronic Calculation:	Result Obtained by Hand Calculation:

Was the computer result verified? Yes No
If no, complete a Corrective Action Report for Nonconforming Events.

This result was confirmed by _____ on _____
Name Date

VENDOR APPROVAL RECORD

CEI LABS
Authorization for Suppliers and Services

Date: _____

Authorization Requested by _____

Name of Supplier: _____
List goods and/or services requested by supplier/vendor below:

_____

Evaluation:

1. Goods and/or services provide by this vendor are appropriate to CEI's needs in purity, and purpose so as not to compromise the quality of CEI's analytical services.	Yes	No	
2. A cost analysis is performed by the Laboratory Director to determine if the value / cost of the item or service is acceptable to CEI Labs, Inc. Is the cost analysis acceptable to the Laboratory Director?	Yes	No	
3. When possible, the vendor providing the supplies, reagents, or standards must adhere to an International Standard. Does this vendor calibrate its standards, or products derived thereof, to an International Standard? (i.e. can they provide certificates of trace-ability?)	Yes	No	N/A
4. Does the supplier/vendor provide Material Safety Data Sheets (MSDS) for standards and reagents purchased by CEI?	Yes	No	N/A

I authorize this vendor/supplier for goods and/or services to CEI Labs, Inc. until such time as they are reviewed, and found unable to meet the evaluation criteria established by CEI Labs, Inc.

_____ _____
Lab Director Date

APPENDIX V
CHEMICAL HYGIENE PLAN

CEI LABS, INC.
Chemical Hygiene Plan

Prepared by: Tianbao Bai, Ph.D., CIH
Date Prepared: April 26, 2001
Revised by: Marti Bowers
Date Revised: November 13, 2014

107 New Edition Court
Cary, North Carolina 27511
Tel: 919-481-1413
Fax: 919-481-1442

Table of Contents

Foreword

The protection of the safety and health of its employees, students and environment is a high priority of CEI Labs, Inc. On January 31, 1990, the Occupational Safety and Health Administration (OSHA) promulgated a rule for occupational exposure to hazardous chemicals in laboratories. This rule is designed to help protect laboratory workers from the hazards of the chemicals they use. Section 1 provides a definition of which workplaces are considered laboratories under this standard. Included in the standard is a requirement that all employers covered by the standard develop a Chemical Hygiene Plan (CHP). A CHP is a written program which sets forth work practices, equipment use and maintenance procedures, and personal protective equipment requirements that protect employees from the hazards presented by chemicals used in the lab. According to OSHA, the CHP must include standard operating procedures, criteria for the implementation of chemical control measures, measures to ensure proper operation of engineering controls, provisions for the training of workers, provisions for medical consultation in the case of exposure, designation of responsible people in the lab, and identification of procedures for the use of particularly hazardous substances or procedures. This document satisfies this requirement. It is up to the lab supervisor to supplement this plan with more detailed information about the proper use of the particular chemicals used in the lab. These supplements may be in the form of written procedures, literature libraries, video presentations, and/or group or individual training. The lab supervisor and Chemical Hygiene Officer, if one is appointed, are responsible for the interpretation and enforcement of policies described in this CHP.

Section 1: Responsibilities, Application, Coordination

1.0 Chemical Hygiene Responsibilities and Program Coverage

1.1 Chemical Hygiene Responsibilities

Environmental health and safety responsibilities at CEI Labs, Inc. (CEI), including chemical hygiene responsibilities, are described in the CEI's Environmental Health and Safety Policy. Duties specific to laboratory chemical use are described in this section.

A. Laboratory Manager

The laboratory manager has the ultimate responsibility for chemical hygiene throughout the laboratory, and, with the assistance of laboratory safety programs, supports the chemical hygiene efforts of lab workers.

Specifically, the lab manager shall:

• Develop and implement appropriate chemical hygiene policies and practices specific to the operations of the lab(s) they are responsible for.
• Perform regular, formal chemical hygiene inspections, including inspections of emergency equipment. The frequency of these will be set by the laboratory CHP, based on the professional judgment of the lab manager. Weekly housekeeping inspections and monthly equipment inspections are suggested.
• Develop Standard Operating Procedures specific to their lab's operations.
• Determine the proper level and type of personal protective equipment for lab operations.
• Ensure that appropriate training has been provided to employees.
• Maintain a current knowledge concerning the legal requirements of regulated substances in the laboratory.
• Review and improve the Chemical Hygiene Plan on an annual basis.

B. Chemical Hygiene Officer

The lab manager may name a Chemical Hygiene Officer (CHO) with appropriate training and experience to assist with the activities described above. If no person is named CHO, the lab manager will retain responsibility for all chemical hygiene activities.

C. Laboratory Workers

The laboratory workers are individually responsible for planning and conducting each laboratory operation in accordance with the Chemical Hygiene Plan and developing good personal chemical hygiene habits.

1.2. Scope and Application of this Plan

This standard applies where "laboratory use" of hazardous chemicals occurs. Laboratory use of

hazardous chemicals means handling or use of such chemicals in which all of the following conditions are met:

• the handling or use of chemicals occurs on a "laboratory scale"; that is, the work involves containers which can easily and safely be manipulated by one person,
• multiple chemical procedures or chemical substances are used, and
• protective laboratory practices and equipment are available and in common use to minimize the potential for employee exposures to hazardous chemicals.

At a minimum, this definition covers employees who handle or use chemicals at CEI. Certain non-traditional laboratory settings may be included under this standard at the option of individual departments within the company. Where the use of hazardous chemicals provides no potential for employee exposure, a Chemical Hygiene Plan is not required.

1.3. Coordination with Other Standards and Guidelines

Although this standard deals only with use of hazardous chemicals, employees may also encounter potential physical, biological or radioactive hazards in the laboratory. In the event that there is a conflict between provisions of various standards, the OSHA should be contacted to assist in resolving the discrepancy.

Section 2: Information and Training

2.0 Employee Information and Training

2.1 Information

It is essential that laboratory employees have access to information on the hazards of chemicals and procedures for working safely. Managers must ensure that laboratory employees are informed about and have access to the following information sources:

• The contents of the OSHA lab standard, Occupational Exposure to Hazardous Chemicals in Laboratories, and its appendices (29 CFR 1910.1450).
• CEI Labs, Inc. Chemical Hygiene Plan (this document) and local lab standard operating procedures.
• The Permissible Exposure Limits (PEL) for OSHA regulated substances.
• Material safety data sheets (MSDS) for laboratory chemicals. These are available from collections on the Internet, and are also located in many individual laboratories. Departments that receive MSDS's directly with chemical shipments will make such information available to the employees using the chemicals.

2.2 Training

Each laboratory manager is responsible for ensuring that laboratory employees are provided with training about the hazards of chemicals present in their laboratory work area, and methods to control exposure to such chemicals. Each employee shall receive training at the time of initial assignment to the laboratory, prior to assignments involving new exposure situations, and at a regular frequency.

A. Availability
Training is available in the form of:
• Literature describing proper lab practices (see Sections 5).
• Video libraries.
• Group and individual training, conducted by lab personnel.

B. Content
Employee training programs will include, at a minimum, the following subjects:
• Methods of detecting the presence of hazardous chemicals (observation, signage and labeling, odor, real-time monitoring, air sampling, etc.).
• Symptoms associated with exposures to hazardous chemicals.
• Good laboratory practice, including general techniques designed to reduce personal exposure and to control physical hazards, as well as specific protective mechanisms and warning systems used in individual laboratories.
• Emergency response actions appropriate to individual laboratories.
• Applicable details of the departmental Chemical Hygiene Plan, including general and laboratory-specific Standard Operating Procedures.

Section 3: Implementation of Control Measures

3.0 Criteria for Implementation of Control Measures

3.1 General Criteria

This Chemical Hygiene Plan is intended to limit laboratory workers' exposure to OSHA-regulated substances. Laboratory workers must not be exposed to substances in excess of the permissible exposure limits (PEL) specified in OSHA rule 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances or Threshold Limits Values set by the American Conference of Governmental Industrial Hygienists. PELs refer to airborne concentrations of substances and are averaged over an eight-hour day. A few substances also have "action levels". Action levels are air concentrations below the PEL which nevertheless require that certain actions such as medical surveillance and workplace monitoring take place.

Guidance: Pay particular attention to the following paragraph. If you, as a lab manager or CHO, suspect exposure concentrations exceed allowable levels, please contact the Management for technical assistance. An employee's workplace exposure to any regulated substance must be monitored if there is reason to believe that the exposure will exceed an action level or a PEL. If exposures to any regulated substance routinely exceed an action level or permissible exposure level, control measures must be implemented.

A. Professional Judgment

The lab manager can use professional judgment to assess the nature of chemical exposure resulting from a lab procedure and prescribe engineering controls and personal protective equipment to be used during the procedure. This judgment will be documented through use of Standard Operating and Laboratory Chemical Safety Summaries written for the chemicals in use.

B. Air Sampling

Air sampling for evaluating employee exposure to chemical substances shall be conducted on an as needed basis (to be determined by the lab supervisor). Conduct air sampling if there is reason to believe that exposure levels for regulated substances that require sampling routinely exceed the action level, or in the absence of an action level, the PEL. Air sampling will be conducted according to established industrial hygiene practices. It may be conducted by lab workers, chemical hygiene officer, or outside consultants. The results of air sampling studies performed in the laboratory should be sent to the chemical hygiene officer for records maintenance.

3.2 Criteria for Implementation of Specific Control Measures

Engineering controls, personal protective equipment, hygiene practices, and administrative controls each play a role in a comprehensive laboratory safety program. Implementation of specific measures must be carried out on a case-by-case basis, using the following criteria for guidance in making decisions.

A. When to Use Fume Hoods

The laboratory fume hood is the major protective device available to laboratory workers. It is designed to capture chemicals that escape from their containers or apparatus and to remove them from the laboratory environment before they can be inhaled. Characteristics to be considered in requiring fume hood use are physical state, volatility, toxicity, flammability, eye and skin irritation, odor, and the potential for producing aerosols. A fume hood should be used if a proposed chemical procedure exhibits any one of these characteristics to a degree that:

- (1) airborne concentrations might approach the action level (or permissible exposure limit),
- (2) flammable vapors might approach one tenth of the lower explosion limit,
- (3) materials of unknown toxicity are used or generated, or
- (4) the odor produced is annoying to laboratory occupants or adjacent units.

Procedures that can generally be carried out safely outside the fume hood (depending on the capacity of the general ventilation system to remove any airborne contaminants) include those involving:

- (1) water-based solutions of salts, dilute acids, bases, or other reagents,
- (2) very low volatility liquids or solids,
- (3) closed systems that do not allow significant escape to the laboratory environment, and
- (4) extremely small quantities of otherwise problematic chemicals.

The procedure itself must be evaluated for its potential to increase volatility or produce aerosols.

B. When to Use Safety Shields or Other Containment Devices

Safety shields, such as the sliding sash of a fume hood, are appropriate when working with highly concentrated acids, bases, oxidizers or reducing agents, all of which have the potential for causing sudden spattering or even explosive release of material. Reactions carried out at non-ambient pressures (vacuum or high pressure) also require safety shields, as do reactions that are carried out for the first time or are significantly scaled up from normal conditions. Other containment devices, such as glove boxes or vented gas cabinets, may be required when it is necessary to provide an inert atmosphere for the chemical procedure taking place, when capture of any chemical emission is desirable, or when the standard laboratory fume hood does not provide adequate assurance that overexposure to a hazardous chemical will not occur. The presence of biological or radioactive materials may also mandate certain special containment devices. Local exhaust ventilation may be required for equipment that exhausts toxic or irritating materials to the laboratory environment. Ventilated chemical storage cabinets or rooms should be used when the chemicals in storage may generate toxic, flammable or irritating levels of airborne contamination.

C. When to Use Personal Protective Equipment

Laboratory managers or CHO's shall designate areas, activities, and tasks which require specific types of personal protective equipment. Protective equipment shall not be worn in public areas, in order to prevent the spread of chemical or biological contamination from laboratory areas.

Eye Protection

Eye protection is required for all personnel and any visitors whose eyes may be exposed to chemical or physical hazards. Side shields on safety spectacles provide some protection against splashed chemicals or flying particles, but goggles or face shields are necessary when there is a greater than average danger of eye contact. A higher than average risk exists when working with highly reactive chemicals, concentrated corrosives, or with vacuum or pressurized glassware systems.

Protective Clothing

Lab coats or other similar clothing protectors are strongly encouraged for all laboratory personnel. Lab coats are required when working with select carcinogens, reproductive toxins, substances which have a high degree of acute toxicity, strong acids and bases, and any substance on the OSHA PEL list carrying a "skin" notation. Bare feet are not permitted in any laboratory. Sandals and open-toed shoes are strongly discouraged in all laboratories and are not permitted in any situation where lab coats or gloves are required.

Gloves

Gloves made of appropriate material are required to protect the hands and arms from thermal bums, cuts, or chemical exposure that may result in absorption through the skin or reaction on the surface of the skin. Gloves are also required when working with particularly hazardous substances where possible transfer from hand to mouth must be avoided. Gloves should be carefully selected using guides from the manufacturers. General selection guides are available; however, glove resistance to chemicals will vary with the manufacturer, model and thickness. Therefore, review a glove-resistance chart from the manufacturer you intend to buy from, before purchasing gloves.

Respiratory Protection

Respiratory protection is generally not necessary in the laboratory setting and must not be used as a substitute for adequate engineering controls. Availability of respiratory protection for emergency situations may be required when working with chemicals that are highly toxic and highly volatile or gaseous. If an experimental protocol requires exposure above the action level that cannot be reduced, respiratory protection will be required. All use of respiratory protective equipment is covered under the CEI’s Respiratory Protection Program.

Section 4: Management of Engineering Controls

4.0 Management of Engineering Controls

The engineering controls installed in the laboratory are intended to minimize employee exposure to chemical and physical hazards in the workplace. These controls must be maintained in proper working order for this goal to be realized. No modification of engineering controls will occur unless testing of the modification indicates that worker protection will continue to be adequate. Improper function of engineering controls must be reported to the lab manager immediately. The system shall be taken out of service until proper repairs have been executed.

4.1 Local Exhaust Ventilation

The following procedures shall apply to the use of local exhaust ventilation:

• Openings of local exhaust will be as close as possible to the source of the contaminants.
• Local exhaust fans shall be turned on when exhaust hoods are being used.
• After using local exhaust, operate the fan for an additional period of time sufficient to clear residual contaminants from the ductwork.
• The ventilation system shall be inspected annually by the chemical hygiene officer.
• Prior to a change in chemicals or procedures, the adequacy of the available ventilation systems shall be determined by the lab manager.

4.2 Laboratory Hoods
Work practices shall follow the Standard Operating Procedures. Prior to the introduction of new chemicals, the adequacy of hood systems available shall be determined by the lab manager. Ductless fume hoods re-circulate exhaust air through filters back into the room. Therefore, they can not be used for volatile toxic materials and should be posted as "Not for use with toxic materials." Consult the CHO before using these hoods to control lab vapors.

4.3 Chemical Storage Cabinets

Storage cabinets for flammable and hazardous chemicals will be ventilated as needed. They will provided with a spill containment system appropriate to the chemicals stored in them.

4.4 Emergency Equipment
Eye washes must be flushed monthly by the user. This will ensure that the eye wash is working, and that the water is clean, should emergency use become necessary. Fire extinguishers are checked annually by the local Fire Department.

Section 5: Standard Operating Procedures

5.0 Standard Operating Procedures for Laboratory Chemicals

Standard Operating Procedures are generally accepted practices for use of chemicals in particular situations. These SOPs can be overridden in specific instances when appropriate. It is advisable to document the reasons for such modifications. When SOPs are not available for a specific lab situation, the lab manager and CHP will develop them.

5.1 General Principles

A. Controlling Chemical Exposure

Each laboratory employee shall minimize personal and coworker exposure to the chemicals in the laboratory. General precautions which shall be followed to achieve this goal during the handling and use of all chemicals are as follows:

• A chemical mixture shall be assumed to be as toxic as its most toxic component. Possibilities for substitution will be investigated.
• Laboratory employees shall be familiar with the symptoms of exposure for the chemicals with which they work and the precautions necessary to prevent exposure.
• Eating, drinking, and smoking is prohibited in areas where laboratory chemicals are present. Hands shall be thoroughly washed after working with chemicals. Storage, handling and consumption of food or beverages shall not occur in chemical storage areas, nor refrigerators, nor with glassware or utensils also used for laboratory operations.
• Each employee shall keep the work area clean and uncluttered. All chemicals and equipment shall be labeled with appropriate hazard warnings. At the completion of each work day or operation, the work area shall be cleaned.
• Mouth suction for pipeting or starting a siphon is prohibited.
• Skin contact with all chemicals shall be avoided. Employees shall wash exposed skin prior to leaving the laboratory.
• Additional specific precautions based on the toxicological characteristics of individual chemicals shall be implemented as deemed necessary by the lab manager.

B. Laboratory Equipment

The following rules shall apply to the use of laboratory equipment:
• All laboratory equipment shall be used only for its intended purpose.
• All glassware will be handled and stored to minimize breakage; all broken glassware will be immediately disposed of in the broken glass container.
• All evacuated glass apparatus shall be shielded to contain chemicals and glass fragments should explosion occur.
• Waste receptacles shall be identified as such by signs attached to the receptacle.
• All laboratory equipment shall be inspected on a periodic basis and replaced or repaired as necessary.

C. Planning for Emergencies

Before work with laboratory chemicals begins, plans for various emergencies will be developed. The circumstances to be covered include fire, chemical spill, and personnel exposure. In addition, the following work practices will be observed:

• Spill containment will be established around areas in which more than one liter of liquid is used.
• Workers manipulating chemicals will always be in easy communication of other people while handling chemicals
• Emergency equipment (e.g., HEPA vacuum cleaner) will be checked on a daily basis for unusual conditions

5.2 General References

Laboratory operating procedures found in Prudent Practices in the Laboratory: Handling and Disposal of Chemicals (National Research Council, 1995) are adopted for general use at CEI Labs, Inc. The topics included in this reference are outlined in Section 11. A second useful manual is the American Chemical Society's Safety in Academic Chemistry Laboratories. This manual presents information similar to that found in Prudent Practices, but in a considerably condensed format.

5.3 Specific Policies for Safe Practices in Laboratories
Certain standard operating procedures have been adopted by CEI Labs, Inc. specifically for its own laboratories.

5.4 Lab Specific SOP'S
Laboratory specific Standard Operating Procedures are available in each lab where they are applicable. The SOP'S developed for a specific lab should be listed in the Lab CHP form.

Section 6: Particularly Hazardous Procedures

The OSHA Lab Standard requires that special consideration be given to use of chemicals or procedures with particular hazards. The definition of "particularly hazardous chemicals" is given in the OSHA lab standard. Examples of such chemicals are given in Chapter 3 of Prudent Practices. This consideration requires either the development of special operating procedures or prior approval of the laboratory supervisor as indicated by a written permit describing the conditions for the work to be done.

6.1 Work with Particularly Hazardous Substances

When laboratory procedures include the use of highly hazardous chemicals, special precautions shall be implemented as deemed necessary by the lab manager. These precautions will be developed for work with select carcinogens, reproductive toxins and substances which have a high degree of acute toxicity. Development of these precautions will consider including the following provisions in the special procedures:

- Establishment of a designated area for the use of the high hazard chemicals.
- Signage and access control to the work area where the chemical is used.
- Special precautions such as use of containment devices such as glove boxes; isolation of contaminated equipment; practicing good laboratory hygiene; and prudent transportation of very toxic chemicals.
- Planning for accidents and spills.
- Special storage and waste disposal practices.

Prudent Practices provides detailed recommendations for work with particularly hazardous substances.

6.2 Pre-approval of Particularly Hazardous Work

A permit system shall be utilized for all laboratory activities which do not follow standard or special operating procedures and which thus require pre-approval by the laboratory manager. These activities include off-hours work, sole occupancy of lab and unattended operations. The toxicity of the chemicals used, the hazards of the procedures to be done, and the knowledge and experience of the laboratory workers must be considered in deciding which work will be allowed with pre-approval. Off-Hours Work Procedures: Laboratory personnel are not permitted to work after hours in the lab, except when permit conditions are met.

Working Alone: Work shall not be performed in the laboratory when the only person in the room is the laboratory person performing the work. Under unusual conditions, crosschecks, periodic security guard checks, or other measures may be taken as established by a permit. Unattended Operations: When laboratory operations are performed which will be unattended by laboratory personnel (continuous operations, overnight reactions, etc.), the following procedures will be employed:

• An appropriate permit will be written and posted.
• A sign will be posted at all entrances to the laboratory.
• The overhead lights in the laboratory will be left on.
• Precautions shall be made for the interruption of utility service during the unattended operation (loss of water pressure, electricity, etc.).
• The person responsible for the operation will return to the laboratory at the conclusion of the operation to assist in the dismantling of the apparatus.

Section 7: Emergency Response

7.0 Chemical Spills, Releases and Accidents

7.1 Emergency Response

Telephone numbers of emergency personnel, managers and other workers as deemed appropriate are posted on the lab entrance. These signs will be checked annually for accuracy.

7.2 In Case of Fire

CEI's policy is that the first reaction to a fire is to evacuate the occupants of the building. Fire extinguishers are available in labs and are inspected annually. They may be used by trained personnel to fight small fires.

7.3 In Case of Spills

In the event of a chemical spill, release or other accident, lab workers will respond as outlined in the Emergency Response plan. The size of the spill and its hazards will guide the appropriate response. Note that proper emergency response depends upon a knowledge of the hazards present in the lab. For this reason, a companywide inventory of the hazardous chemicals in CEI labs is conducted annually.

7.4 In Case of Personnel Exposures

All employees shall be instructed in the location and proper usage of emergency eyewashes. The eyewash shall be inspected monthly. In case of medical emergency, call 911 immediately.

Section 8.0: Medical Consultations and Examinations

8.0 Medical Consultations and Examinations

8.1 Availability

All employees who work with hazardous chemicals will have an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances:

• Whenever an employee develops symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory.
• Where exposure monitoring reveals an exposure level routinely above the action level or PEL for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements.
• Whenever an event takes place in the work area such as a spill, leak, explosion or other ccurrence resulting in the likelihood of a hazardous exposure.

The management will be contacted whenever the need for medical consultation or examination occurs, or when there is uncertainty as to whether any of the above criteria have been met.

8.2 Arranging for Exams

All medical examinations and consultations will be performed by or under the direct supervision of a licensed physician and will be provided through CEI, without loss of pay and at a reasonable time and place. In the event of a life-threatening illness or injury, dial 911 and request an ambulance.

8.3 Information

CEI Labs, Inc. will provide the examining physician with the following information:

• The identity of the hazardous chemical(s) to which the employee may have been exposed.
• A description of the conditions under which the exposure occurred including quantitative exposure data, if available.
• A description of the symptoms of exposure that the employee is experiencing, if any.

The above information will be collected and transmitted by the lab manager and will be submitted to the examining physician.

8.4 Report

The examining physician will provide to the lab manager a written report including the following:

• Any recommendation for further medical follow-up.
• The results of the medical examination and any associated tests.

• Any medical condition which may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous chemical found in the workplace.
• A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment.

The written opinion will not reveal specific findings of diagnoses unrelated to occupational exposure.

Section 9: Recordkeeping

9.0 Recordkeeping

CEI policy is to maintain safety records as required by OSHA at a minimum.

9.1 Accident Reports

Accident investigations will be conducted by the lab manager with assistance from the CHO as deemed necessary. Accident reports will be written and retained for 5 years.

9.2 Exposure Evaluations

Any records of exposure evaluation carried out by individual departments will be kept within the department. Raw data will be kept for one year and summary data for the term of employment plus 30 years.

9.3 Medical Consultation and Examinations

Results of medical consultations and examinations will be kept by CEI for a length of time specified by the appropriate medical records standard. This time will be at least the term of employment plus 30 years as required by OSHA.

9.4 Training

Individual employee training should be recorded kept in the individual's department for five years.

9.5 Equipment Inspection

Records of inspections of equipment will be maintained for 5 years. Data on annual fume hood monitoring will be kept in the individual laboratory. Fume hood monitoring data are considered maintenance records and as such the raw data will be kept for one year and summary data for 5 years.

Section 10: Annual Chemical Hygiene Plan Review

The laboratory manager and CHO will review the laboratory's Chemical Hygiene Plan every January. Results will be provided to the corporate management and the department laboratory manager. Laboratory managers are responsible for assigning responsibility for taking corrective action for any deficiency noted.

Section 11: Chemical Inventory

The following chemicals are found in the laboratory at CEI:

Asbestos Laboratory

- Baking Soda – Arm and Hammer
- 70% Isopropyl Rubbing Alcohol
- 1-1-1 Trichloroethane
- Silicone Spray by CRC
- 1.550 R.I. Dispersion Staining Oil (16 oz bottles)(Cargille)
- R.I. Liquids, Series A, Set A ½ 1.460-1.640 (Cargille)
- R.I. Liquids, Series B, Set B ½ 1.464-1.700 (Cargille)
- R.I. Liquids, Series 1.705, 1.710, 1.715, 1.720(Cargille)
- Cargille R.I. Melt Mount, 1.550, 1.680, and 1.605
- Hydrochloric Acid, Concentrated
- Hydrochloric Acid, 5%
- Distilled Water
- Dry-Right Dessicant
- Various types of asbestos
- Acetone
- Triacetin

Microbiology Laboratory

- Agar, Granulated
- Aniline Blue
- CiDecon
- Dextrose
- Dri-Clean
- Glycerin
- Lactic Acid
- Malt Extract Agar
- Peptone
- Phenol, crystals
- Potato Dextrose Agar
- Sabouraud Dextrose Agar
- SporGon
- Tartaric Acid, 10%
- Versa-Clean

APPENDIX VI

REVIEWED LABORATORY SUBCONTRACTORS AND SUPPLIERS

CEI Labs, Inc. Vendors & Suppliers 2015

Issuing Authority: Gary A. Swanson, Quality Manager
Date: January 27, 2015

Vendor Name	Contact	Phone Number	Product/Service	Original Approval Date	Review Status Acceptable / Further Review Needed / Unacceptable	Reason for Review Status
Thermo-Fisher Scientific	Dan Holiday	800-766-7000	Laboratory Equipment& Supplies	Before 2000	Acceptable	Previous experience / No dissatisfaction with products.
Environmental Monitoring Systems	Michael Knight	800-293-3003	Laboratory Equipment& Supplies	Before 2000	Acceptable	Previous experience / No dissatisfaction with products.
Triangle Environmental Service Center	Feng Jiang	804-739-1751	Laboratory Supplies (slides / cover slips)	Before 2000	Acceptable	Previous experience / No dissatisfaction with products.
Ted Pella, Inc.	Customer Service	800-237-3526	Laboratory Supplies	August 2011	Acceptable	Previous experience / No dissatisfaction with products.
Martin Microscope Company	Bob Martin	864-242-3424	Microscope Cleaning & Repair	Before 2000	Acceptable	Previous experience / No dissatisfaction with products.
Micro-Optics	Phillip Wiseman	718-961-8833	Microscope Parts	Before 2000	Acceptable	Previous experience / No dissatisfaction with products.
Miller Fabrications	Matt Miller	919-876-3848	Hoods / Ventilation	Before 2000	Acceptable	Previous experience / No dissatisfaction with products.
AIHA-LAP, LLC	Lauren Schnack	703-846-0716	Accreditation Organization	2003	Acceptable	Currently Maintaining Accreditation
Great Scopes, Inc.	John Lind	877-454-6364	Stereo Microscopes	2005	Acceptable	Previous experience / No dissatisfaction with products.
SanAir Technologies, Laboratory, Inc.	Sandra Sobrino	804-897-1177	Backup Laboratory Services	2009	Acceptable	Previous experience / No dissatisfaction with products.
Arc Micro Optics	Phil Hutcheson	859-498-1345	Microscopes	2010	Acceptable	Previous experience / No dissatisfaction with products.
SIA	Vitaly Feingold	770-232-7785	Laboratory Equipment & Digital Cameras	August 2011	Acceptable	Previous experience / No dissatisfaction with products.
Research Triangle Institute	Owen Crankshaw	919-541-7470	Proficiency Testing Samples, TEM, PLM; Laboratory Standards	Before 2000	Acceptable	Previous experience / No dissatisfaction with products.
Environmental Hazards Services	Customer Service	800-347-4010	Lead in Air, Paint, Soil; Metals	Before 2000	Acceptable	Previous experience / No dissatisfaction with products.
Schneider Laboratories, Inc.	Raja Abouzaki	804-353-6778	Metals, Organics Testing	Before 2000	Acceptable	Previous experience / No dissatisfaction with products.

Vendor Name	Contact	Phone Number	Product/Service	Original Approval Date	Review Status	Reason for Review Status
EMLab P&K	Customer Service	866-871-1984	Culturable Mold	2003	Acceptable	Previous experience / No dissatisfaction with products.
Galson Laboratories	Customer Service	888-4352-5227	Culturable Mold, Specialty Testing	2003	Acceptable	Previous experience / No dissatisfaction with products.
Indoor Biotechnologies	Customer Service	843-984-2304	Allergens, Pollen Testing	2010	Acceptable	Previous experience / No dissatisfaction with products.
EMSL	Customer Service	800-220-3675	Radon Testing	Before 2009	Acceptable	Previous experience / No dissatisfaction with products.
Electron Microscopy Sciences	Customer Service	215-412-8400	Electron Microscopy Supplies	2011	Acceptable	Previous experience / No dissatisfaction with products.
CAELAP	Fred Choske	510-620-3155	Accreditation Organization	2002	Acceptable	Currently Maintaining Accreditation
NVLAP	Hazel Richmond	301-975-4016	Accreditation Organization	Before 2000	Acceptable	Currently Maintaining Accreditation
Hogentogler & Co., Inc.	Nancy Acevedo	410-381-2390	Laboratory Furnaces and Ovens	March 2012	Acceptable	Previous experience / No dissatisfaction with products.
Rory Tabbatt	N/A	310-706-8733	TEM Consultant	Novmeber 2011	Acceptable	Previous experience / No dissatisfaction with services.
AIHA-PAT	Angela Oler	703-846-0792	Proficiency Test Provider	2003	Acceptable	Previous experience / No dissatisfaction with services
Klarmann Rulings, Inc.	Customer Service	800-252-2401	Calibrated Reticules & Slides	2003	Acceptable	Previous experience / No dissatisfaction with services
DIS	Mark Truelove	919-828-2300	Information Technology Services	2015	Acceptable	Knowledge of system data base
Carbonite	Customer Service	877-222-5488	Electronic Information backup and storage.	January 2015	Acceptable	Meets our need for backup information storage.
Thomas Scientific	Dede Hickman	dedeh@thomasci.com	Laboratory Equipment &Supplies	2012	Acceptable	Meets our need for laboratory supplies.

Reviewed By _____ Date 1/27/15

Tianbao Bai, PhD, CIH, Laboratory Director, CEI Labs.